Bothwell Castle: Banqueting Hall.

BOTHWELL CASTLE. By G. S. Aitken, F.S.A.Scot.

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NOT the least pleasant part of an architectural association's work are the visits paid to old towers and castles, a few large, others small, or it may be in some cases fragments of foundations, but all with some history of their own, and at one time the dwellings of men, women, and little children who had a larger share of the rough side of life than we are called on to experience, with as compensation a greater toughness of physical frame and density of mental faculty that enabled them to do their part amid all the hardships of the time. We like to imagine these old buildings as in their completeness, and are best pleased perhaps with some ruin that leaves much to conjecture. Many reasons may be given why we love these old ruins, the children of the dawn of architectural history in our land.

We would not care to live in them ourselves as when in their complete form; nevertheless, we find them appealing to our sense of fitness for their purpose, and sharing with the ecclesiastical architecture of the time inspiration in design which never palls, and which will ensure sympathy so long as the buildings last. Age has garnitured the ruins with many a wildflower sprung from seed blown by the autumn breeze or dropped by some inconsiderate bird. The woods of fir, sycamore, and elm which form so fitting a setting were mere saplings, or probably not there at all, when the castle was built. Its situation was chosen only secondarily for amenity, and chiefly for security, and to be within signal of its neighbour stronghold. Some of these fortresses were the appanage of royalty; others—and of course the greater number—were subject dwellings, many of them held by nobles or by men of lesser degree. The occupiers might be bound at one period in a common opposition and united defence against an invading foe, and at another divided among themselves, every man's hand against his neighbour.

With neither industries nor manufactures, the country only partly tilled, large areas used

as hunting grounds where still roamed the boar and the wolf and the stag, need we wonder that the peasant was a serf, and the main business of his master—strife?

And so we find the dwellings of the period to which the early part of our study belongs, built to provide against certain or uncertain attack, sentinel on outlook, drawbridge to uplift, portcullis to drop, arrow or shot-holes facing the attacking party on all sides, with machicolations above from which, unseen and protected, the besieged might aim at the swarming host below.

In this unsettled mode of life we could hardly expect to find much attention paid to art or quality of work, and yet in these two points we discover remarkable excellence in the subject of our study—Bothwell Castle.

Bothwell Castle is on the north bank of the river Clyde, about 8½ miles south-east from Glasgow. It is founded on the Old Red Sandstone, and defended on the west and south by the steep slope that rises up from the rocky bed of the river. On the east and north is level meadow land, with here and there trees of great age. The opposite bank of the stream is covered with woods, concealing within their shade the ruins of Blantyre Priory. Bothwellhaugh, which gave name to the Hamilton who shot the Regent Moray at Linlithgow, is not far off; and further down is a bridge on the line of one of the ancient Roman highways which ran from the west end of the Hadrian Wall to the west end of the Antonine Wall. Nearer the Castle is Bothwell Bridge, the scene of the conflict between the Covenanters and the Duke of Monmouth on 22nd June 1679. Within view of the castle are Bothwell village and its church, the eastern part of the latter very interesting and dating from the end of the fourteenth century; while all around are names of places and objects associated with mediæval history.

The castle was originally of great size, with double tower entrance, great western circular tower, south-eastern and several smaller towers—numbering ten in all—connected by curtain walls and enclosing an area of nearly one acre.

All that we now see is the great western and south-eastern towers, with their connecting lofty wall, and walls extending on the east and west to a later one, which running west to east reduces the area to two-thirds of its original extent. Within this restricted space are the chapel and hall, with indications of other buildings long since removed.

North of this enclosure are the foundations of the great entrance and of four other towers, and within the ruined area is a grove of elm, sycamore, and beeches, many of them stately trees, two of the beeches having their trunks four feet, and a third five feet, in diameter at the height of a man from the ground.

At one time, the lower part of the curtain was covered on the outside with ivy, which, however picturesque, is no friend to old walls, as may be seen on comparing the honeycombed masonry it concealed while growing, with the smooth surface of the wall above. It is necessary to take the corroding effect of this removed ivy into account if we would avoid the mistake of assigning it an antiquity it is not entitled to.

In years gone by visitors imagined that the southern section comprised the whole of the ancient castle; but it happened in the year 1888 that an old plan, showing buildings beyond the visible ruins, was discovered in the library of Bothwell House, and on an effort being made by the Earl of Home, the proprietor, to trace out by excavation its original extent, the interesting barbican towers and relating curtain walls were disclosed.

The earlier part of Bothwell Castle is the great circular western tower which, while erected as part of a future complete scheme, was originally made a fortalice, entire in itself, defended on one side by a moat with a postern door to the south. The door, being at some height from the ground outside, must have been approached by a flight of steps: it is in two

orders, the outer having a segmental head, the inner a horizontal chamfered lintel, each end carried on jamb corbels and forming a tympanum above. The soffit of the outer order next to the tympanum has a slit about 12 inches broad, continued upwards to what is very like a fireplace recess in a guard-chamber, through which missiles could be discharged on any presuming assailant. There has been no portcullis, and the entrance has been further defended by three loopholes in the adjoining round tower. This tower is to the west of the door and of three stories in height. The lower story may have been a prison; the first floor has an entrance from the court with corbels supporting the lintel, the converse in outline of those at the postern door. On the west side of the tower are passages from each floor leading through the thickness of the wall to the great western tower, and a passage on the other side to the guard-room referred to. This guard-room had also an external stone stair to the court, supported partly on an arch the outline of which is still visible in the wall. Immediately above the guard-room is a bartisan, which continues on the same level some distance eastward, and was carried internally on heavy corbelling which formed machicolations for defence against any assailant getting inside.

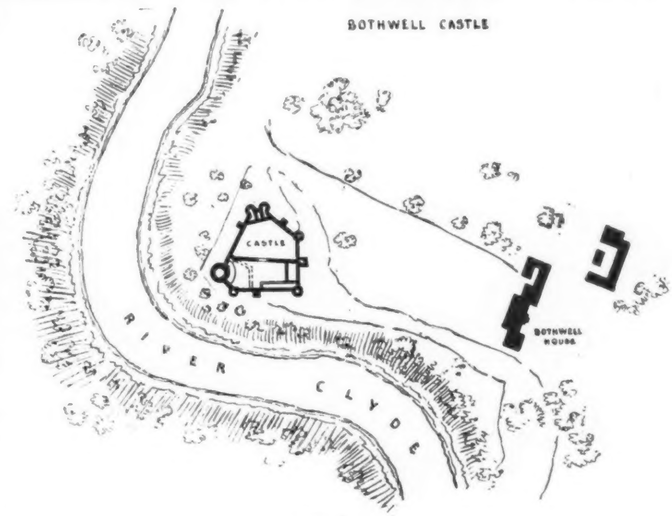


FIG. 1.

FIG. 2.

Still further east from the guard-room is a higher level of masonry with a turnpike stair at the end leading to a tower that projects on the exterior of the castle wall. This tower was approached from the guard-chamber, and must

have formed part of the scheme for defending the postern door. It had its garde-robe down the middle, ending in a dry pit below the level of the court, with an entrance to it on the court level. The circular tower has its garde-robe on the side next the river, projecting on corbels at two different levels and discharging outside.

The arrangement of the tower and passages described, which extended due east and west, about 90 feet in all, is connected with the circular main tower by a curtain wall which trends north-westward nearly 30 feet before it joins the tower, and following an approximate angle of 45°. It is four stories in height altogether.

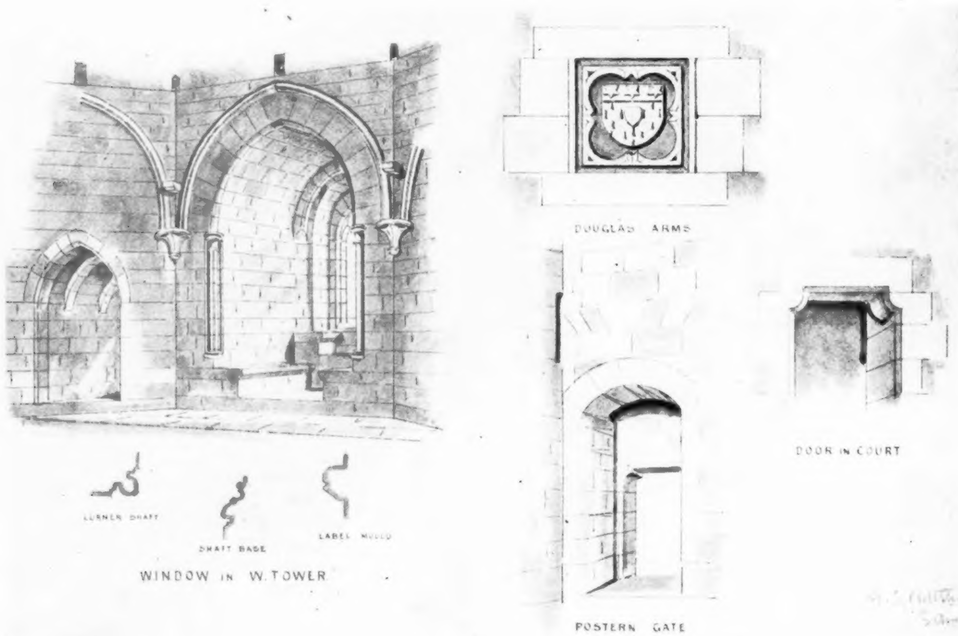


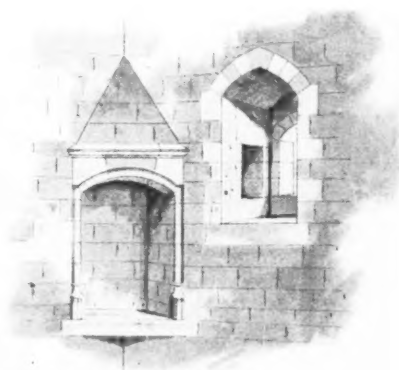
FIG. 3.

Crossing the inner bailey from the postern, we reach the entrance to the tower, which is on the north-east side of it. For its protection there was originally a drawbridge wrought by chains from a vaulted room over the entrance. Further protection was afforded by a portcullis a short distance within, which descended from the same chamber. The passage which it defended deflected from the entrance so as to cause it to open into the tower in the centre of one of its internal octagonal sides. It is heavily and picturesquely groined. The entrance has on the outside a special construction of square masonry projecting from the curve of the tower, thus forming a better working surface for the drawbridge, and also serving to turn the entrance towards the curtain wall and away from the open bailey. The door was protected above in the usual manner by a machicolated parapet at the summit of the tower.

The great tower to which the door gives entrance is 65 feet diameter externally, and octagonal inside, with walls 15 feet thick. At present the western half of the tower is entirely gone, the eastern half having been formed into a series of later rooms by a cross wall made

most probably of the material of the demolished western part, with its own windows and fireplaces.

Originally the tower was a magnificent piece of construction, approaching 100 feet high, in four stories. The lower story contains the well, with its parapet and alcoved semicircular head with "stoup" recess on one side finished with a pointed head. There are a few courses of an octagonal pillar, 5 feet in diameter, of solidly built masonry with a splayed base, standing in the centre of the octagon, and placed with its angles opposite the centre of each side: it does not seem to have gone any higher than the well chamber, and, if we may infer from the springer stone over the well, has been built to receive a segmental arch corresponding with one on the opposite side of the pillar, which would sustain the beams of the wood floor above. There are no indications of vaulting on this level. The descent to this chamber is from a turnpike stair to the right of the portcullis entrance.



FIREPLACE IN S.E. TOWER

WELL IN WEST TOWER

FIG. 4.

The well chamber may have been lit by windows on the demolished west side of the tower, which would, of course, have to be near the ceiling in order to be beyond the reach of assailants. There is no window on the inner side next the court.

The principal chamber, which is immediately above the well room, has a very fine window on the side next the court in a deep recess, of the form usual in castles, with seats at each side. It far surpasses anything of a similar kind in Scotland for the excellence of its masonry and beauty of architectural detail. It is framed off on the side next the hall by shafted and moulded angles, having bases and the remains of carved capitals from which spring chamfered arches: these arches have beyond them moulded wall ribs which start from carved corbels in each angle of the octagonal hall. The window recess is vaulted over by ashlar which continues vertically down to stone seats at each side, and the ashlar curves inwards on plan to a single-light cusp-headed window.

On the vertical sides of this window recess are forty-one different masons' marks. What purpose masons' marks served has not been determined: they are certainly very ancient, having been found on Egyptian masonry. Some writers have supposed them to be symbolic, others that they were put on the stones to show whose work they were, and how much the workmen were entitled to receive in payment. In some stones one mark has been added to the main symbol, either to distinguish the member of the family using the same sign or as the mark of the overseer added to that of the workman.

I would suggest, however, from examination of the special bay at Bothwell that, while the marks might be the property of particular masons, they also served the purpose of indicating the intended position of each stone in the building; that the master mason, in short, as any modern clerk of works would do, plotted the various courses of masonry, marking

on his drawing the symbol of each man to be engaged upon them, and allotting in this way to every hewer his work, which readily found its place in the building on reference to the master mason's original draft.

The mark *may* also have been intended to aid in settling the amount of money that fell to each, and at the same time assigning to the individual mason the credit due him for workmanship. At any rate they serve a useful purpose to the modern investigator; for, although they may not determine the date of work, they show by their difference from marks in other parts of the castle, that independent sets of workmen were engaged at these various parts.

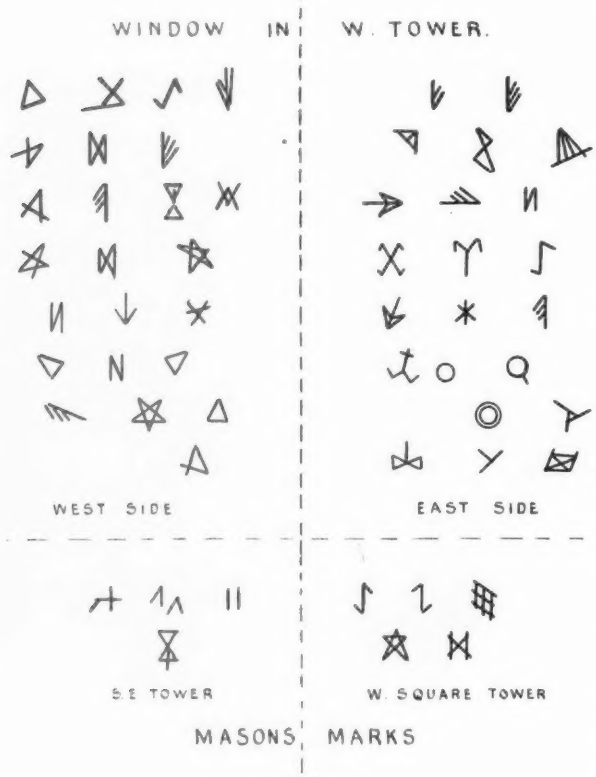


FIG. 5.

In the meantime let me state that of the forty-one different marks I noticed one, the pentacle, which corresponds with marks at Malmesbury (Norman), Furness (twelfth century), Gloucester (eleventh and fourteenth centuries), Canterbury (Norman), and also at the small chapel on the cliff at St. Andrews. Another mark—the **N**—is found also in the Early English crypt of York Minster.

There would no doubt be other three similar window recesses on the destroyed sides of the octagon which must have afforded a remarkably fine view of the river on either hand.

Although the wall ribs and the corbels from which they spring are suggestive of vaulting rising to a crown and then descending to a central pillar, after the manner of Lincoln or Salisbury Cathedral chapter houses, we regret to say, on examining the parts in detail, that no roof so beautiful and monumental covered this fine hall. There are no indications of springers rising from the corbels, and the wall ribs are not square on the extrados, as they would have been were the usual "filling-in" resting upon them; they are simply label moulds.

The floor above, like that over the well chamber, has been of wood resting on beams, the holes for which occur immediately over the points of the label moulds; others also are situated at the same hall in the angles of the octagon.

Plain corbels occur in the angles—about 2 feet—above the carved corbels which most probably supported verticals and struts rising to the angle beams overhead.

In the two top floors there is a vertical slot in each angle and in the centre of each side, extending downwards about 6 feet from each ceiling, with wall holes at the top of them: these grooves or slots were apparently intended to receive vertical timbers from which struts would

spring at the bottom, sloping up to the beams which partly rested on the verticals, passing over them to the holes in the wall behind. If there were corresponding struts springing from a central wood pillar the construction must have been very effective.

The second floor has no window next the court; the third floor has, and it is a two-light cusp-headed window of the Early English period.

The stair, which began at the ground floor, continued to the bartisan, serving each of these chambers on its way; and there were also scale stairs in the thickness of the wall about 3 feet wide; like those at Conisbrough Castle. One of them may be seen in the sectional masonry of the tower on the north side overlooking the river.

A wall runs north-east from the great tower at a somewhat similar angle to that of the south-east wall, but only the lower part is original; the vertical junction between the earlier and later occurs very near the tower. But whether what is known as the water-gate at the bottom of it opening into the moat is ancient is difficult to say; the jambs may be old, but the lintel must have been restored at the time the upper wall was rebuilt. The water-gate has a vertical groove on the inside of the northern jamb, probably for a sluice gate, to allow the water of the moat to be emptied.

FIG. 6.—SOUTH-EAST VIEW

The south-east tower though lofty is only large enough in area to provide one room on each of the floors, which are four in number: none of them have been vaulted; they form in plan a hexagon about 15 feet in diameter. There are none of the indications of defence we find at the great western tower: the basement is entered on the ground level by an ordinary door, but there is no stair inside communicating between it and the floor above, so that it is a puzzle how the first floor was reached. Most probably the stair went up along the east curtain wall and then led through the opening piercing the buttressed projection that stands at right angles to the east curtain, and through which is the present access to the banqueting hall.

From the first floor of the tower a special stair ascends in the thickness of the wall to the summit, giving entrance to each floor. The rooms have canopied fireplaces, that to the first floor having a plain moulding on the jambs and lintel; the second floor mantel has shafts, caps, and bases on the jambs; that of the upper floor, still more elaborate, has a series of grouped shafts on the jambs; the lintels of both these two latter fireplaces are unfortunately broken. The upper room is arcaded in stone all round, there being one semicircular arch to every side of the hexagon. Each room has one window that looks south-eastwards towards the river—the most inaccessible side of the castle—and there is no window to the east except in the top floor. The first floor has also a narrow loophole which commands the whole south curtain wall of the castle.

The east end of the chapel abuts partly against the south-eastern tower and partly against the east curtain wall, and has been the last of a series of apartments which extended along the south curtain wall as far as the east wall of the inner bailey. A gable tangential with the western side of the south-eastern tower has been erected at the eastern end of the chapel, supported below on a series of arches, one springer of which remains on the north wall. The space between this gable and the east curtain formed a passage leading from the tower to the opening through the buttressed wall already referred to, and was roofed over by a "lean-to" resting on a stone gutter built into the curtain. The skew moulds of this roof are still in evidence on the north and south. This passage was lit by a window in the east curtain. The entrance to the chapel was at the north end of the gable: its north jamb still remains.

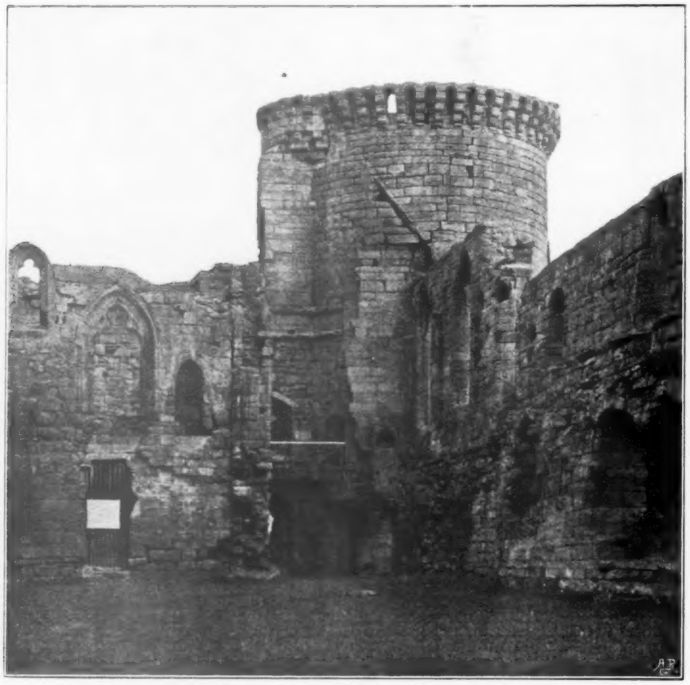


FIG. 7.—CHAPEL AND SOUTH-EAST TOWER.

The chapel has been in three bays, lit on the south side by three windows divided each into two lights by mullions. The floors of it and of the entire range of southern buildings have rested on wood beams, as may be seen from the corbels still existing. A stone seat occurs along the south side of the chapel, rising at the altar end to form a sedilia for the officiating priests, who, we may suppose, had their abode in the south-eastern tower. Luxurious accommodation surely, but then both during the time of the founders and their successors the clergy would be men in high position in the Church. Two of the chapel windows have one of their lights continued to near the floor, so that anyone could sit there and enjoy the prospect.

In the south end of the gable is the piscina, the basin of it discharging into a large cavity about 18 inches diameter with no outlet; the jambs have shaftlets with moulded caps and bases, and the soffit has a pointed segmental moulded archlet: the back is recessed with two pointed panels cusped in the head.

The north wall of the chapel is plain, and is a continuation westward of the buttressed wall referred to; the severance between it and the buttressed wall determines the date of the chapel to be subsequent to that of the south-east tower, and this is confirmed by the appearance of the exterior masonry of the south wall, which shows it to be distinctly later than that of the tower.

A double aumbry occurs at the east end of the north wall, and the remains of a holy-

water basin at the west end next to the general entrance to the chapel. The approach to this door must have been by an outside stair. There was an external door immediately below this opening into apartments underneath the chapel, which were lit on the south by three small windows close to the ceiling. There does not appear to have been any west wall to the chapel, no sign of the junction of any cross wall occurring at this point.

The chapel has been groined over the two eastmost bays with quadripartite vaults; the springers are all there, the two eastern ones resting on single shafts, the others on triple shafts longer than the eastern, and like them resting on corbels; the capitals have all been carved.

The westmost bay has a large moulded corbel immediately to the west of and level with the groin capital, and above it a square hole. On the same level at the spring of the east arch of the west window is a corresponding hole, and about four feet below these two are other two sinkings. Three exactly similar holes exist at corresponding levels in the north wall; the fourth has been broken away. The purpose of these holes has been to receive beams which either formed a gallery for the rood or for officiating minstrels on feast days. The bay over these has not been groined; the south springer of the west groined bay was cut through the middle vertically and finished with an ashlar surface next to the rood beams. This of course confirms the former statement that there had been no west wall to the chapel.

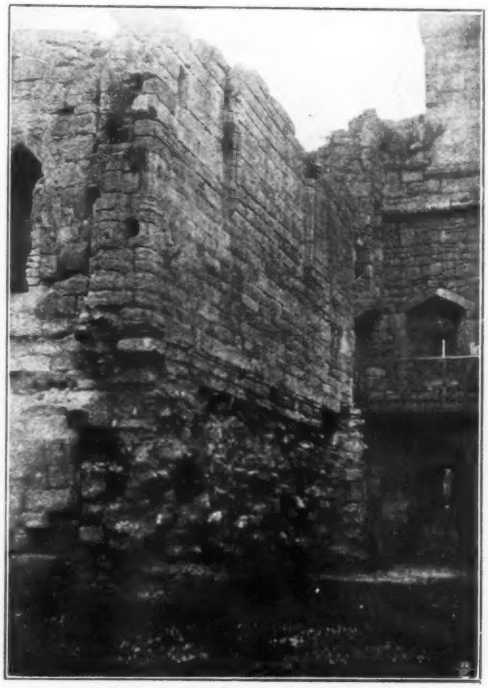


FIG. 8.—NORTH WALL OF CHAPEL

The absence of any west wall suggests that the room to the west was used as a nave, separated from the choir by a screen under the rood: it has three transomed and mullioned windows with seats in the bays, and also a stone seat along the wall like that in the chapel. There is a curious gate recess in the south wall near the screen and another at the west end.

The room under this on the ground floor seems to have been a very important one: it has two transomed and mullioned windows with seats in the bay easily accessible from the floor. The westmost of these windows has two stone corbels on the outside of the wall. It is likely that these corbels supported some kind of balcony commanding a view of the river with a canopy overhead, the window serving as an access to it.

There are two less important rooms on the same level, further west, lit by plainer and smaller windows close to the ceiling. At the extreme west is another gate recess which indicates this part as the western end of the south range of building.

There is a room under the chapel entered from an external door under the west entrance to the chapel, lit by three small windows in the south wall close to the ceiling.

The banqueting hall extends from the north wall of the chapel to a late north curtain wall: its eastern wall is separated from the east curtain by a space of about three feet at

its south end, diminishing to 18 inches at the north end. It has been surmised that the passage or space on the east was intended for a means of escape in emergency; but this cannot have been its purpose, as although there is access to it at the south end there is no egress at the north. The likelihood is that the interval was due to the need for providing an eaves gutter for the east slope of the hall roof, the bottom of which was much lower than the summit of the curtain. Neither the east nor the west walls of the hall bond into the north and south: this suggests that the hall is later than the adjoining work.

The present floor of the hall is about 12 feet above the court level, and rests on three vaults entered by as many different doors from the court, each cellar lit by a narrow window opening into the narrow passage at the east side of the hall. The centre cellar has, besides, a square opening over its door head, which is semicircular; and no doubt the other two doors which have lost their finished masonry were treated in the same way. These vaults with the floor over them are of a date subsequent to the erection of the hall. Assuming them to be away, we see a hall 60 feet long by 30 wide, with a height of about 30 feet from the floor to the wall head, lit on the west side by a very fine range of ten single-light windows having blunt cusped heads, the reveals being the same depth outside and in.

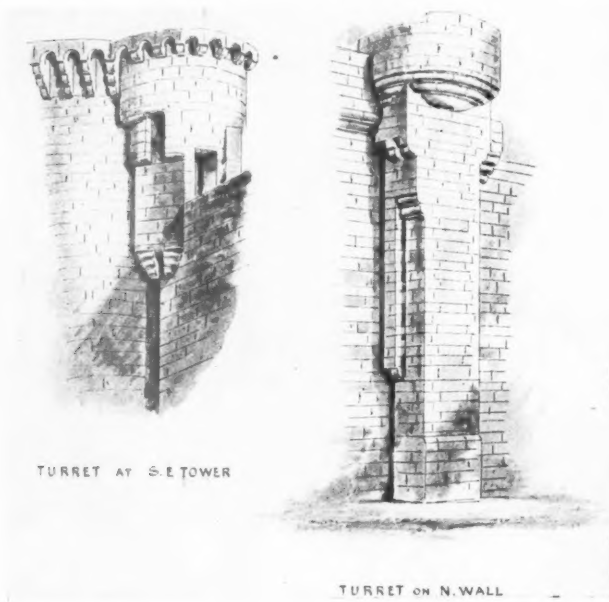


FIG 9.

This height of 30 feet is so considerable as to suggest an arrangement like that of the banqueting hall at Linlithgow palace, with galleries at the sides and south end approached by the doors at each end high up in the west wall, and also by a door in the north of the east wall, and probably also by another at the south end of the same side, where the hall is now entered from the chapel passage.

Besides the range of clerestory lights there is a richly moulded two-light window with traceried head to the south of them. So fine a window suggests that the gallery thus lit was occupied by the residents of the south-east tower, or it may have been used as a minstrels' gallery. The side galleries might be used by spectators of the proceedings in the assembly below, and these we may reasonably suppose from the high position of the occupants of the castle would be often men of great importance. In addition to the clerestory lights there would probably be windows below the west gallery where the later masonry of the three doors and adjacent masonry occur.

The stair to the general entrance of the chapel would form an approach to the doors of the end gallery, and most likely the door at the north end of the same wall was reached in a similar manner, or had some relation to a passage of communication with a range of buildings that was formed to the west of the hall against the north curtain wall. There are the remains

of a large fireplace and flue at the western extremity of this wall which point to such a series of rooms, possibly a kitchen and its adjuncts. There is a garde-robe at the north-west corner of the hall, and a staircase which forms a very picturesque projection on the outside of the north wall.

The hall mantel so far resembles that of Linlithgow in being planned with a double recess—Linlithgow is triple. It has plain chamfered jambs and lintel, the latter supported on flush corbels without any hood. On the central pier is a rough empty sinking, with a shaftlet at the bottom, which most likely carried a coat of arms or group of sculpture.

There is some very interesting masonry in the curtain wall at the north-eastern corner of the hall in connection with a drawbridge which belonged to a square tower now unfortunately in ruins. The bridge opened into the court before the hall was built, was worked by a counterpoise and chains, and must have spanned a space between the tower and a flight of steps. Of course when the bridge was drawn up the steps were useless. The bridge was removed when the hall was erected, but the tower door was retained. The tower was evidently an independent habitation for some of the retainers, forming a series of stories approached by a spiral stair still remaining on its west side. It was accessible also along the top of the east curtain wall through a door which opens out of the circular stair in the south-eastern tower.

FIG. 10.

The details of the barbican and of the other northern parts of the castle are only matters of conjecture. Curtain walls ran on the east from the tower just referred to, and from the great western tower to the barbican; that on the east broken on its way by a circular tower of a diameter similar to that on the south-east, and further on by a square tower balanced by a corresponding one on the west curtain.

Of the complete appearance of the barbican we may be able to form an idea by studying any of the French examples, such as the Châteaux des Langeais, Villebon, and Chaumont, or Caerlaverock Castle nearer home

In these instances we see an entrance between twin towers, with portcullis and drawbridge, defended above and on the flanks in the usual manner. In the case of Bothwell the bridge spanned a deep pit, not necessarily filled with water.

The first recorded owner of the barony of Bothwell was Walter Olifard, who held the position of Justiciary of Lothian in the reign of Alexander III. The Olifards probably came over from France with William the Conqueror. They were settled first in England in the county of Northamptonshire, and were close friends of David, Earl of Huntingdon (afterwards David I. of Scotland), who was living in the neighbourhood. Olifard followed David to Scotland, and was rewarded with lands in Roxburghshire, out of which he gave a grant to Dryburgh Abbey.

It is unnecessary for our purpose to follow the history of the Olifards further than

to say that it was a Sir William Olifard who as Constable of Stirling Castle so gallantly defended it against Edward I. in 1304, and afterwards was one of the signatories to the famous remonstrance sent to the Pope from Arbroath Abbey in 1320. The family in course of time held possessions in Perthshire, and their descendants are now known as the Oliphants of Gask.

By Walter Olifard's eminent position as Justiciary of the Lothians he would have facilities for getting the high class of masons that were engaged on the castle. By his time the Norman method of square tower building had given place to one where the round tower was in use.

It seems unnecessary to suppose that this form of tower was copied from anything across the Channel. The circular tower was already in existence at Abernethy and Brechin in Scotland, in Little Saxham Church, Suffolk, and on a larger scale in some of the Roman fortifications in this country; and it might well have occurred to architects and military engineers of that time that a round tower was better fitted for defence than a square one, which had corners that could be undermined.

After the death of Alexander III. (1292) the barony passed by marriage to the important family of Moray, and was possessed by Sir William Moray, Panetarius, or Chief Butler, of Scotland, who died when on parole in an English prison in the year 1300.

Prior to this date Edward I. took the castle and held it with an English garrison under Stephen Brampton. The Scots retook it by assault after a tedious siege of fourteen months, when by that time most of the garrison were slain, and the survivors at the point of starvation. The victors held it till September 1301, when Edward himself invested it with a large force and obliged them to capitulate. Here he lived from the 17th to the 20th September 1301. Edward then granted the castle and barony to the famous English commander Aymer de Valence, after whom the great circular tower was named the "Valence Tower."

The castle remained in the custody of the English force till 1306, and may at that date have passed to the Scots as the rightful owners; but it must have been under the control of the English again in 1309, as de Valence fled here after his defeat at Loudon Hill; and it was certainly in the hands of the English in 1314 under Sir William FitzGilbert, ancestor of the Hamilton family, for he was able to receive the Earl of Hertford and fifty of his men after their defeat at Bannockburn. Not long after, however, Sir Edward Bruce besieged the castle and compelled the English garrison to surrender.

After the battle of Halidon Hill in 1333, when Scotland was overrun by the English army under Edward III., it fell again into alien hands, and the King himself lived there from 18th November to 26th December 1336; and it is on record that he issued in that year fifteen writs from the castle. In 1337 it was retaken by Sir Andrew Moray, and was then dismantled.

Sir Andrew married Christian Bruce, the sister of Robert the Bruce, and was restored to the house of his fathers by the King under the title of Lord Bothwell. He had two sons, Sir John and Sir Thomas: the elder died without issue, and the widow (Joanna) of the younger son, Sir Thomas, married in July 1361 Archibald, usually known, from his grave countenance, as "The Grim," and so in that way the castle passed from the Morays to the powerful family of the Douglases on the death of Sir Andrew in 1388.

Archibald assumed the arms of the Bothwell house and took the castle for his residence, inserting his arms high over the postern gate. He was created Earl Douglas in that year by King Robert II., who to the honour of the title added the substantial gift of the Douglas estates in Lanarkshire. Archibald died at Thrieve Castle 3rd February 1401, in the seventieth year of his age, and was buried at Bothwell Chapel, which he had founded in 1398. Archibald's descendants—usually known as the Black Douglases—held the castle until at

length, after several changes of ownership, it came into the hands of the Red Douglases. One of them was raised by Charles I. to the marquisate of Douglas, and as a Catholic, was opposed by the Covenanters, who captured his possessions of Tantallon and Douglas Castles. One of his grandsons, Archibald, got a new patent, after the restoration of Charles II., creating him Earl of Forfar in 1661. Under that title he in 1669 is referred to as the builder of Bothwell House, which adjoins the castle, using for that purpose part of the castle masonry.

A change had by this time come over Scottish domestic architecture. The plan arrangements all along from the thirteenth century had agreed with those of England. The English manor houses date from the sixteenth century, and Scotland began to change its domestic architecture at the same period. As the country became settled and prosperous the retainers, who lived within the precincts of the castle, now began to occupy houses of their own; artificers, such as smiths and carpenters, hitherto in the service of the lord of the estate, were no longer wanted in that capacity, and therefore transferred their occupations to the neighbouring villages, and with the advancement of the menial occupants of the castle generally, and also of the lord and his friends, better accommodation was required, and a greater variety of apartments needed, libraries among the rest.

The introduction of gunpowder made the old fortifications useless, and although some of the buildings, such as Crichton Castle in Midlothian, might present a forbidding aspect on the exterior, their courtyards were ornamented with faceted masonry or moulded work of various forms.

When the Renaissance came to Scotland, as it did earlier than into England, the form of domestic plan entirely changed; hitherto it had been four-square, open in the centre; an arrangement which, though beautiful in the East, with fountain and tropical garden, was hardly suitable to the latitude of North Europe. This open area was now covered in; the staircase made a fine feature of; the forms of the doors and windows became more varied, chimneys were made prominent, resembling the Elizabethan forms in their spiral detail. Rich plaster ceilings took the place of the painted wooden ones, and tapestry and wainscoting were extensively used. Mantelpieces, important hitherto, were still a conspicuous part of the house, reflecting the characteristic hospitality of the people, but formed now of finer and softer material, such as marbles and rich woods.

Such a plan as that of Bothwell Castle, with its detached buildings, inconvenient domestic apartments, its principal rooms still stately, but reminiscent of planning for defence, and its other points of objection too numerous to mention, would compel the resident family to follow the spirit of the time and erect a house elsewhere if the castle was unfit for adaptation.

This step was taken in the seventeenth century by Archibald Douglas, as we have mentioned. There can be no doubt that till that time he was in occupancy of the castle, living very likely in the south-eastern tower, with its adjacent apartments on the south side facing the river, retaining the chapel for domestic use, after the Presbyterian form of worship.

It was probably he who altered the fine hall by the erection of the three great cellars for storage underneath, planting the grove of trees now so stately on the northern part of the castle site to cover the devastation made by the removal of that part of the fortalice for the purpose of building the new south wing of Bothwell House. The wing of the house is plain and solid, and, as compared with the ancient castle which it supersedes, prosaic in architecture externally, but more than compensating for the inferiority by its internal comfort and the beauty of its plaster ceilings.

The Earl, with no fear of siege before his eyes, has so placed it as to command very charming views on its south, east, and west sides.

Whether it was intended to be a complete building as it was at that date, we cannot, of course, say; but Earl Archibald was content with it for the space of about half a century, dying in 1712. His son, the second Earl of Forfar, only survived him three years, passing away at Stirling of wounds received at the battle of Sheriffmuir in 1715. Monuments to both father and son were erected in Bothwell village church by the widow of Archibald. She continued to live in the modern house till her death there in 1741.

A Stewart succeeded to the estate, and was created Baron Douglas 8th July 1780. Following the fashions of the time in which James Gibbs and the Adams played so large a part, he resolved to extend Bothwell House, erected more than a century before, and engaged a London architect—James Playfair, the father of W. H. Playfair, afterwards an eminent Edinburgh architect—to erect what is now the centre of the mansion, adding a northern wing to balance the original house, which thus became a southern wing. Among the sketches prepared by James Playfair was one that provided for a colonnade on the east of the centre side, and continued in the form of quadrants to the wings—a very common arrangement at that time. But this fine scheme was not adopted.

A very good marble mantel by Westmacott, the father of Sir Richard Westmacott, is in the dining-room. The extension appears to have occupied in erection from 1785 to 1789. It may be of interest to mention that it was in Bothwell House, in 1808, that Sir Walter Scott wrote *Young Lochinvar*, and had the pleasure of reading it to an audience, among whom were Lady Dalkeith and Lady Douglas.

Baron Douglas also began to build a new castle at Douglas after a design by William Adam, which appears in the *Vitruvius Scoticus*, and is evidently with its round towers inspired by the ancient Bothwell Castle.

Baron Douglas died 26th December 1827 at the advanced age of eighty-one years. His elder granddaughter married Cospatrick, the eleventh Earl of Home, who was created Baron Douglas in 1875. Through this connection Bothwell House and Castle were transferred to the Home family, now represented by Charles Alexander, twelfth Earl of Home and second Baron Douglas of the new creation.

Bothwell Castle.

NOTES ON THE PLENUM SYSTEM OF VENTILATION.

By WILLIAM HENMAN [*F.*].

IN the Paper which I read last December on the Royal Victoria Hospital, Belfast,* I particularly stated it was not my desire to raise controversy on the subject of mechanical *versus* natural means for securing ventilation; yet, as members then present expressed the opinion that it might with advantage be further discussed, the Council of the Institute have appointed the 6th of June for that purpose.† If the time then at our disposal is to be well employed, the subject of ventilation generally must be dealt with on practical and scientific lines; and as that was not attempted in the Paper to which I have referred I venture to suggest some reasons which tend to show that plenum ventilation can be beneficially employed in certain buildings, and ought to be more closely studied by members of the architectural profession.

A primary necessity is to arrive at a concisely correct definition of what should be understood by the term "efficient ventilation" when applied to occupied buildings. Apart from outside contaminating influences which would affect ventilation by whatever means obtained, I suggest it is "continuous change of air within a building without causing discomfort or adversely affecting the health of the occupants."

The province of an architect in connection therewith is to dispose buildings on the ground, construct and equip them, so that the available air may be supplied in ample quantities, freed from suspended impurities, tempered and regulated to requirements without deterioration.

Buildings are erected principally to secure greater comfort than can at all times be obtained in the open.

By the erection of buildings, movement of air within them is necessarily less than it would be over the unoccupied site.

Change of air within a building is principally brought about by an ascertainable force—either of propulsion or extraction—although the law of diffusion—*i.e.* the process which brings about intimate mixture of gases without chemical combination—is a serviceable but less powerful agent in connection with ventilation.

If these premises be accepted, the question which has to be discussed is not whether by plenum ventilation a condition within doors can be secured equal to the open air at its best, but whether it can be employed in certain buildings, suitably constructed, so as to obtain at reasonable cost more constant and efficient ventilation than can be secured by other means.

A great hindrance to the proper comprehension of this subject is the employment of unscientific terms such as "artificial ventilation," "automatic ventilation," "natural ventilation," "mechanical ventilation," because they prejudice the mind. Ventilation is a result brought about either by natural or mechanical force. Moved by either, air is the same, just as water is the same, whether allowed to flow naturally or forced on by mechanism. Water may become fouled on its way, so may air, whether it pass in naturally or is propelled in its course from the outside to the inside of a building; but it does not in the least follow that fouling results from the power which caused its movement.

It is scientifically wrong to refer to a fire causing a "suctional" influence in a flue, for it does nothing of the kind. Air when heated expands and is specifically lighter than an equal volume of colder air; it is the latter descending by the force of gravitation which propels the warmer air upwards; consequently an open fire in a room causes change of air by propulsion; moreover, the propelling force of wind is far greater than the suctional influence it exerts upon air within buildings. By realising these facts it is easy to understand that "plenum" ventilation is more in accord with nature's methods than "exhaust" ventilation.

Notwithstanding the acknowledged extravagance of, the dust and dirt resulting from, and the unpleasant draughts at times set up by, the open fire, I for one appreciate its cheerfulness, and believe it will long hold an honoured place in the British home. The mere fact that it necessitates an upcast flue is of the greatest service in connection with ventilation; but as the area of an ordinary smoke flue at the chimney-pot end does not greatly exceed half a superficial foot, the volume of air which can pass through it in a given time is limited, as is also the heating power of a single fire-grate. Consequently, for larger apartments two or more fires are required, and it is well known that unless an adequate supply of air be otherwise provided, smoke will at times be drawn down one or other of the flues. For this and other reasons hot water, steam, air heated by stoves or electricity, are used, none of which demand an upcast flue or flues from the apartment to be warmed thereby. Yet for the health

* JOURNAL R.I.B.A., 19 Dec. 1903.

† For the purposes of the discussion reported *infra*, the author's unrevised draft of this Paper was issued to members with the last number of the JOURNAL.

and comfort of occupants, change of air is a necessity, and can only be brought about by providing suitable inlets and outlets. This is a simple statement of fact of the utmost importance in connection with ventilation, yet too often neglected, resulting doubtless from difficulty in determining the positions, dimensions, and construction of such openings, and I incline to the belief that strong advocates of what they term "natural ventilation" are of the *laissez faire* order who expect nature to do everything for them; and as they do not consider whence the wind cometh nor whither it goeth, they provide neither suitable entry nor exit for it in the construction of buildings.

With regard to the possibilities and difficulties of ventilating an apartment warmed by other means than open fires, say a church or assembly room. Suppose it is a calm frosty day, with the temperature inside several degrees higher than it is outside. If inlet-openings are provided at or near the floor level and outlets at or near the ceiling level, a steady flow of air will take place from the inlets to the outlets proportionate to the difference between the internal and external temperature, and to the relative sizes and positions of the openings, brought about simply by the propelling force of the colder air outside falling by gravitation; but it does not follow that ventilation will be "efficient" even if the openings are adequate and well placed, because the differences in temperature may not suffice to cause adequate change of air—the opening of a door or window will upset the relative proportions between inlets and outlets, probably causing draughts. Moreover with a number of people seated on the floor area, and with air entering around the lower portion of the walls, it can only arrive at those in the centre after becoming fouled by passing over the bodies of those nearer the inlets; but it is more than likely that the bulk of air passing through the room will travel from the inlets to the outlets without changing the air in the central portion. Every variation in temperature or in the force of wind outside will alter the conditions within, and during summer weather the temperature may be considerably higher outside than in; every factor is then reversed. Some improvement may be effected in cold weather by giving the incoming air an upward tendency and providing up-cast flues as outlets with well-distributed openings near the floor level. The incoming air will then fill the upper portion of the room, gradually descend, change the atmosphere throughout, and pass away up the flues; but this arrangement of flues is not altogether satisfactory in summer weather, and even under such conditions change of air will fluctuate with every variation in the force of the wind outside. Consequently, with the best possible arrangements, so long as natural means alone are relied on, there must be constant, intelligent, and personal attention if comfortable ventilation is to be secured; nevertheless I am bound to confess that with care in the design and arrangement of suitable inlets and outlets, with adequate heating power, and with proper means for regulation, it is quite possible with personal attention to secure reasonable ventilation by natural means in buildings only occasionally occupied. None but very sensitive people are quickly affected by breathing a partially vitiated atmosphere, and few remain for long at a time in crowded places, so that when rooms are unoccupied windows and doors should be freely opened, and ample change of air secured. If this were regularly done, and thorough cleanliness were observed in and about buildings, there would be less cause for complaint of defective ventilation.

Every individual by respiration and exhalation throws off moisture and animal matter, and when a number of people congregate within an apartment the defilement of the atmosphere is considerable. Rapid change of air will carry much away, but with defective ventilation much is deposited upon exposed surfaces in the building in consequence of variation of temperature, and only prolonged and greater change of air than would be tolerated while a room is occupied will dissipate the contamination.

In the hope of disposing of the charge which has been made against me, that I am a prejudiced advocate of "plenum" ventilation, I now state most distinctly that unless it is continuously applied it is questionable whether it can be permanently successful, and I am not inclined to advocate its employment *unless* its advantages are considered worth the cost of continuous working. I cannot think it is sufficient to ventilate a building simply for the periods during which it is occupied and then to stop the mechanism and bottle up the air until the next period of occupation.

Let me illustrate this by directing your attention to a railway carriage. Standing still how stuffy it often is, particularly in hot weather; but when rapidly moving along it is freshened up. Yet, on again standing still, it loses its freshness. That is an example of ventilation produced by mechanical means intermittently employed.

Now I wish to explode another fallacy.

Downward ventilation has been termed "down draught," apparently in the hope of condemning it by giving it a bad name. Advocates of the open fire have stated that to propel air into the upper portion of a room and let it go out from the lower portion is unnatural. Fortunately this can be easily disproved. Take an ordinary room with an ordinary open fire and smoke flue. Test it as you will, and, apart from occasional strong winds setting up adverse currents, resulting at times in what are termed "smoky chimneys," it will be found that the only detectable outgoing of air takes place by the open fireplace flue, the lower opening of which is

about 2 ft. 6 in. above the floor level. Many people open the upper portion of a window when the temperature of a room, heated by an open fire, is excessive, holding the idea that they are letting out the hot air; but with rare exceptions the temperature of the room is then lowered by letting in a larger volume of colder air, which compels a more rapid outgoing of heated air up the flue.

It is true that in most cases no special inlet for air is provided, and that in consequence air enters by any casual, and probably dirt-concealing holes, cracks, and crevices — mostly around the lower portion of the room—whence it makes its way in narrow streams, moving with considerable velocity towards the fireplace, causing unpleasant draughts, while little change of air takes place in the upper portion of the room. Yet, if the same room were provided with a suitable inlet at a foot or two below the ceiling, on the same side as the fireplace and as central thereto as may be, the incoming air would become tempered by contact with the ceiling, walls, furniture, &c.—previously warmed by radiant heat from the fire—it would, by its inflow, force the atmosphere of the room downwards towards the fireplace opening and up the flue to the open, without causing discomfort to occupants.* Under these conditions air is propelled into the room from a reasonable elevation, where it is generally fresher than near the ground-level and more free from chance contamination. Force of wind outside, varying as it does in intensity, will materially affect velocity of change within. I have therefore devised a simple automatic regulating inlet, consisting of a curved enclosure to a noiseless flap hung eccentrically so that the area of the inlet opening is diminished proportionately to the force of wind playing against it; but satisfactory results can be obtained even without this refinement if the inlet be provided with louvres for distributing the air at low velocity. I am perfectly aware it is not the method usually adopted, nor is it the one recommended in most works on ventilation. Do not, however, condemn it without proper trial; think it out, and you will, I believe, come to the conclusion, as by practical experience I have, that it is most effective in securing the efficient ventilation of an apartment; and if so, then the relative positions advocated for inlets and outlets with the "plenum" system are correct.

Complaints being so frequent of defective ventilation—even in buildings where outlay has been incurred in the expectation of securing, let us say, comfortable ventilation by natural means—is it surprising, when we consider the marvellous results of mechanical power, now used for the benefit of mankind in almost numberless ways, that attempts should be made to employ it for improving the ventilation of buildings?

Mining operations and many occupations have for years been carried on which would have been impossible without the assistance of ventilation brought about by mechanical means. Thousands of power-driven rotary fans and air-propellers are in daily use, proving the possibility of changing the air of enclosed spaces. Centuries ago the necessity for securing greater change of air within buildings than could at all times be naturally procured was recognised, and a few advanced minds suggested the employment of bellows and other primitive appliances worked by hand or water-power. I have seen quaintly illustrated treatises on the subject; and although failure doubtless resulted from inadequate knowledge and appliances, there is no reason why, with air-propellers and power appliances brought to the high state of perfection they are to-day, we should not take advantage of them for securing ventilation within buildings.

It is no argument to say, "I don't like plenum ventilation," or even to point to failures which have occurred; nor is it sufficient to bring forward some fanciful idea that in an undefined manner air moved by mechanical power is deprived of an unknown vital essence. It has been suggested that by warming air otherwise than by the sun's rays this intangible essence is destroyed, and that is given as a reason why some people condemn plenum ventilation; but it is altogether begging the question, because in summer time, when "plenum" ventilation is so effective in maintaining a cooler atmosphere within doors than in the open, no heating is employed. Will it then be contended that, by lowering the temperature, such will-o'-the-wisp essence again disappears? Unfortunately my scientific knowledge is not sufficiently profound to enable me to determine if there is even an element of truth in these imaginings; but even if there be, which I strongly doubt, it is easy to demonstrate that with a carefully devised installation of ventilation on the plenum system, the necessary warming and cooling of air are effected with less chance of deterioration than by any other method. In addition to which the air is drawn from sources known to be at a distance from contamination; it can be cleansed from suspended impurities, brought to suitable hygrometric condition, and passed on to apartments without contact with impurity.

I am, perhaps, as painfully conscious as any-one that there have been many failures with "plenum," and so there have been with every other method employed for securing ventilation; but my experience convinces me that failure is not the fault of the system, but that it results either from want of knowledge and experience on the part of those who installed it, or from neglect. It is only by careful comparison of results and a

* See article on Ventilation in *Modern House Construction*, vol. v. (Blackie and Son, Ltd. 1899.)

minute examination of the means and methods employed that a true estimate of its value can be ascertained. Personally I have not the faintest doubt that by the "plenum" system the efficient ventilation of a building can be effected. The principle is perfectly sound; yet I realise there are two sets of objections to be met: the first I class as purely fanciful, most of which I have already dealt with; the second are more tangible, and relate to the means and appliances which should be employed and the cost. To review all the means and appliances at disposal is quite out of the question on the present occasion, but they have a very decided influence, not only as regards partial or complete success, but also a direct bearing on the question of first cost and maintenance.

Much as I dislike making comparison between the work of others and that with which I have been connected, this discussion has been forced on, and we are to meet in the hope of gaining instruction which may be placed at the service of the public. Consequently I shall briefly compare, principally as regards costs of power employed, a few installations of plenum ventilation, and as I shall make use of information derived from printed particulars given by the engineers themselves, we shall at least have fairly reliable data.

Messrs. Carroll & Batchelor, of Dublin, neither of whom is personally known to me. It runs thus:—

"I had been greatly interested in the accounts I read from time to time of the progress of the Royal Victoria Hospital, Belfast, and more particularly in the arrangements for heating and ventilating it. I have had some experience of the plenum system, and have never been much in love with it. I looked therefore rather with distrust on a building which had been so designed as to make such a system obligatory. Mr. Henman is to be complimented and congratulated on his courage in designing such a hospital, and I am free to confess that the result, so far as I was able to judge during my short visit, affords him ample justification for his inversion of many of the accepted canons in hospital design. I was particularly struck by the wonderful uniformity of the temperature maintained in the hospital throughout the twenty-four hours—such as could not, I believe, be obtained by natural means. The freshness of the air in the wards was remarkable, and there was a complete absence of that peculiar odour which is familiar to everyone having to do with hospitals. These results are obtained, I was glad to see, without draught, nor was there any perceptible movement of air in the wards. Everywhere I went through the hospital I saw evidence of great forethought and skill in design, particularly in those small details which count for so much in the economical administration of the institution. The building is a credit to the architects and also to the contractors, who have put such honest and—if I may use the expression—sympathetic work into it. Everything appears to have been done as well as it was possible to do it."

Building.	Cubic feet of air per hour.	Change of air per hour.	Power.	Estimated horse-power.	Annual cost for power.	Annual cost per million cubic feet.
Glasgow, Art Galleries	9,050,000	Not stated, probably 3 times.	Electricity	66	*£2,695	£298
Manchester, Technical School	12,000,000	$3\frac{1}{2}$,,	,,	80	£3,224	£269
,, Midland Hotel	6,000,000	3 ,,	,,	40	£1,612	£269
Birmingham, General Hospital	13,000,000	7 ,,	,,	19	£766	£59
Belfast, Royal Victoria Hospital	5,000,000	7 ,,	Steam	$5\frac{1}{4}$	£100	£20

Consider the importance of such a comparison as regards the number of changes of air effected per hour. May not success in great part depend upon giving an adequate change of air? And surely the question of cost would be a determining factor in many cases.

Reference to the Paper by Mr. Henry Lea given in the Institute JOURNAL for 10th December 1903 will show how this economy in cost of power is effected. In the discussion which followed, Sir John C. Holder personally testified to the success of plenum ventilation in the General Hospital, Birmingham, which he has systematically visited, one may say almost daily, during and since its erection. I could produce a large number of letters addressed to me containing congratulations on the satisfactory ventilation of that and the Royal Victoria Hospital, Belfast; but I prefer to place before you one because it was not written to me, and because it is from an architect experienced in hospital design, viz. Mr. Batchelor, of

It has been well said that the only way to arrive at a right judgment as to the practical utility of plenum ventilation is to carefully examine it in a building in which it has been applied with knowledge and experience. All I ask, in conclusion, is that the subject may be approached without prejudice or regard to merely personal interests and fanciful misgivings, for a right understanding by the architectural profession on the subject of ventilation must have a vital influence on the health and well-being of the people.

* The costs of running are worked out proportionately to the amount of power, presuming it is employed continuously.

DISCUSSION ON THE PLENUM SYSTEM OF VENTILATION*

At the General Meeting of the Royal Institute of British Architects, Monday, 6th June 1904.

The President, Mr. Aston Webb, R.A., F.S.A., in the Chair.

Mr. S. PERKINS PICK [*F.*] read the following remarks:—Before offering any criticisms upon this very interesting hospital at Belfast, I think that every credit should be given to Messrs. Henman & Cooper for the courage—one may almost say the audacity—with which they have formulated and carried out in all its details a hospital building in a manner so utterly at variance with nearly all preconceived notions of buildings of this class. It must be a source of great gratification to them that the institution after eight months' occupation should prove so absolutely satisfactory to those who have the working and management of it. I have had the pleasure of making a careful inspection of this hospital under the guidance of the superintendent, and am bound to confess that in hardly any other instance have I ever received such a laudatory description from the authoritative head of such an institution; indeed, this enthusiasm was not confined to the superintendent alone, but the sisters, the nurses, the engineer, and even the patients themselves, appeared to be equally pleased with the general arrangements provided, and with the heating and ventilation system installed.

Now, after stating this it may appear to be blowing hot and cold when I add that, in spite of all the satisfaction expressed, in my judgment the "Plenum" system of heating and ventilating for a hospital is not essential; nor do I think that the advantages of administration gained by having the wards all on one floor are commensurate with the risks incurred, and the loss involved, by the omission of those side windows for prospect and ventilation which most of us so dearly love and appreciate.

In hospitals the superficial area and cubic space required to attend properly to each patient are necessarily very large, and therefore the requisite changes of air are less difficult to obtain than in such buildings as assembly halls, workshops, schools, out-patients' departments, and similar places where a large number of people are closely packed together. For these latter buildings I am firmly convinced that, up to the present time, no system gives such satisfactory results as a properly designed "Plenum" system, especially so when some mechanical means is arranged for creating a positive extraction of the vitiated air.

In my opinion a hospital planned in separate pavilion blocks, arranged with windows on either side of the wards, with a bed between each pair, an easily cleaned ventilating heating coil between each pair of beds, and with central open fires, is preferable.

To me it appears that this well-recognised style of building is more pleasant for the patients, and adapts itself so readily to effectual ventilation by opening the windows that the complications of a "Plenum" system of heating and ventilation are unnecessary. Moreover, the fact should not be overlooked that in hospitals the majority of patients are in bed, and thus are able to protect themselves from any direct cold draughts which may occur. I know it may be said that the ordinary atmosphere of some of our large towns is so laden with blacks and impurities that it is desirable to wash and filter the air before allowing it to enter a hospital, and in some densely populated districts where hospitals are on restricted areas this contention may be used as an argument in favour of the "Plenum"; but at Belfast the new hospital is erected on an open site of six acres, with the prospect in the near future of this area being doubled, so that the contention does not, I think, hold good in this case.

For operating theatres and out-patients' departments I am of opinion that the "Plenum" system is not only desirable, but is almost essential: in the former because the heating and ventilation are easily controlled, and in the latter because without some mechanical appliances, of which none are better than the "Plenum," it is almost impossible to properly ventilate a waiting hall crowded with people of the lower classes, and generally entirely surrounded by surgeons', physicians' and other rooms.

The arrangements provided at Belfast for the out-patients' department are, in my judgment, quite excellent, and, although crowded on the occasion of my inspection, the various rooms were entirely fresh and healthy.

I agree with Mr. Henman that great caution is necessary in the application of "Plenum" ventila-

* See Mr. Henman's Notes on the subject, *ante*, pp. 427–29; and the Papers by Messrs. Henman and Lea on "The Royal Victoria Hospital, Belfast," Journal R.I.B.A., 19th December 1903.

tion, and that full knowledge is required to apply the system successfully; indeed I would go further and say that, in my judgment, the causes of failure with mechanical systems of heating and ventilation generally, and particularly with the "Plenum," more often rest with architects than with heating engineers. I have heard of architects who not only mature their plans, but actually commence building operations before deciding upon the system of heating and ventilation. Can one wonder at the failure of a system, particularly one like the "Plenum," which largely depends for its success upon flues of ample area and good lines, when arranged under such adverse conditions?

Another cause of failure in the "Plenum" is that of defective drainage, especially when a building is upon a clay subsoil. This matter is so extremely important that it is difficult to overrate its significance.

In some large institutions I have myself noticed that exposed drains have been arranged to cross ducts in an open pipe connected with an ordinary earthenware drain-pipe just outside the duct walls. Any settlement of the duct walls is sufficient to break the joint between the junction of the iron and earthenware drains. These ducts usually carry steam and other pipes, and consequently the temperature in them varies very considerably, indeed quite sufficiently to cause the same joint to be broken by contraction and expansion of the length of exposed iron pipe. In a clay subsoil it is extremely difficult to ascertain whether the damp in walls is ordinary ground moisture or whether it is a sewage saturation. To pump air along ducts where there is a possibility of this is, I think, the most fatal danger to be guarded against, and wherever the "Plenum" system is adopted I think that all drains should be dropped below the level of the air ducts, and should generally be carried out with strong cast-iron pipes.

Spacious ducts are requisite for carrying steam, hot water, and other pipes to the various blocks of all large institutions, and the same danger which I have indicated exists in all these buildings; but it is largely intensified in the case of "Plenum" ventilated buildings.

Messrs. Henman & Cooper have at Belfast wisely provided a separate duct for the necessary hot-water and other pipes, the main air supply duct being thus kept nearly clear of them. The lines of drains appear to have been so arranged as not to cross the main air supply duct; I was unable to ascertain whether or not they were kept below the level of the main duct, but what did seriously frighten me was the enormous length of drains which must of necessity be below the hospital buildings. There are the drains from the several operating theatres, and from a number of ward kitchens and bath-rooms, with the complications of traps and anti-syphonage pipes thereto belonging, the latter being all properly carried up through the roof. The whole system is, I was informed, of iron pipes, apparently planned and executed with great care; but the very unpleasant fact remains that there is a length of about 450 feet of straight main drain, not reckoning the very large number of branch drains connecting with it, all below a dark though, it is true, well-ventilated space under the buildings. Mr. Henman will no doubt correct me if I am wrong, but the only traps to any of the fittings I could find were those immediately below the various sinks, &c., and some floor traps. If I am correct, it has not therefore been thought desirable to make use of that ordinary outside trap or gully which usually intercepts sink, bath, and other wastes before drainage finds its way into the foul pipes below the ground. There also appeared to be a lack of those inspection chambers to the drains under the buildings which most of us think are essential in complicated drainage systems for institutions like this. These no doubt are omitted because of the fact that they must, if provided at all, be below the hospital buildings.

I cannot help thinking that this drainage system may prove a source of difficulty in the future.

Among other details I inspected the cast-iron vertical drain-pipes connecting the fittings to the drains, and, in the case of those which apparently received the wastes from baths and slop hoppers, the calked lead joints already begin to show unmistakable signs of drawing. This contraction and expansion caused by hot water running down the pipes is very difficult to obviate safely in a system like that adopted at Belfast. In ordinary cases, where the pipes are all outside a building, the use of an expansion joint is an efficient method, because if the joint slightly opens, the pipe discharging into an outside gully obviates any serious objection; but in the case of this hospital it may be the joints immediately below the fittings, thus opening the drainage system to the hospital, or it may be the joints of the pipes below the building that will draw. From what I saw it does not appear likely that the drains can remain bottle-tight for any lengthened period.

Possibly it may be argued that, supposing there were a few leaky joints in the drainage system, what does it matter, when there is a constant sufficient pressure of air from within the building to prevent any sewer gas finding its way inside? But most of us will, I think, agree that it is better to keep dangers of this kind at arm's length, by putting all drains outside the buildings where they are open to the atmosphere; and I think this one objection to the arrangement of a hospital on one floor, extending over such a large area as that we are discussing, and thus necessitating all these internal drains, would wisely prevent most architects from adopting the plan of a "Plenum" ventilated one-story hospital.

Another detail of the sanitary system to which I think exception may be taken is the low termina-

tion of the ventilation pipes to the w.c.'s at the end of the wards: these are carried only just through the roof at the balcony ends, and when the atmosphere is still it appears to me that there is some chance of a down draught from them being objectionable to any patients who happened to be on the balconies.

The arrangement of the nurses' slop-room and the w.c. for patients I do not like. I am quite well aware that the objection I am about to make is found in many other hospitals, but that does not, in my opinion, lessen the fault of it, which is that the patients' w.c. is approached through the nurses' work-room, where they must spend a good deal of time washing utensils, mackintoshes, &c. Nurses, I know, become case-hardened, and do not seem to have, or at any rate are not allowed to show that they have, that delicacy about such an arrangement which most of us have; but is it not a little too bad to arrange a w.c. in a manner like this at Belfast and elsewhere, where the division between that and the nurses' work-room is merely a wood partition, which for good reasons is kept well off the floor, and finishes well short of the ceiling level, with the result that it must at times be very difficult for any, even a case-hardened nurse, to face it out? I certainly think that the patients' w.c. ought to be better separated from the nurses' slop-room than is the case here, where the main point has appeared to be so to plan the sanitary annexe as to facilitate the one outlet in the w.c. for the "Plenum" system of ventilation, which, I am pleased to add, acts in a remarkably efficient manner in ventilating the annexe.

A somewhat similar arrangement is provided for the ophthalmic wards, where the patients' w.c. is placed in a corner of the bath-room; this, surely, is not so good a plan as providing a w.c. separately approached from the ward.

The non-provision of any larders to the ward-kitchens is, I presume, explained by the proximity of all the wards to the main kitchen. But sufficient milk has to be kept there for the day and night supply, and this in a temperature of 60° cannot be an improvement upon the ordinary method of providing a small larder, well ventilated from the outside, for this purpose.

I notice that Mr. Henman states that open windows with "Plenum" ventilation are objectionable, and that by making all the windows of the sanitary annexes fixed he is able to delete the intercepting lobbies, which may possibly be justified in this case; but, speaking generally, I am strongly of opinion that it is a great mistake to construct fixed windows. There are many days in the summer time when it is difficult by the "Plenum" ventilation to obtain that freshness in a building which is so desirable; in such cases why should the windows not be opened? What does it matter in such a case, if the flues are well arranged from sources of contamination, whether they universally act the right way or not? And, besides, in many classes of buildings are there not times when by opening the windows a good air flushing can be given to them without incurring the expense of running the fans at all?

The engineering work of this hospital has undoubtedly been designed and carried out in a most careful and able manner. There are, however, some points about this portion of the work which might possibly have been improved. I consider that the bottom of the main air inlets should have been at least 8 feet above the ground level instead of about 3½ feet, as they are. The boiler-house should have doors or shutters to prevent cold air getting to the boilers, and good top ventilation provided in lieu of the openings. The feed-water to the boilers was on the day of my inspection nearly cold: this is a serious mistake, as it not only increases fuel consumption, but is detrimental to the boilers themselves. The hot well which receives the condensed water is not a good plan; better arrangements can now be had by dealing with the various condense and waste mains leading from the several receptacles which contain steam by an arrangement of heater-condensers. The exhaust steam from engines, &c., after performing various functions in heating hot water, is allowed to go to waste; this is not the most economical arrangement. There are a good many steam traps in the buildings which might have been left out had the system of piping been laid out on more modern lines.

The engines and fans for the "Plenum" arrangements are excellent in design and finish, but whilst I say this I cannot but feel that it would have been better for the engineering scheme had it been laid down more comprehensively, and made to embrace the general lighting of the institution by electricity, using the exhaust steam from the generating engines for supplying the whole of the hot water required, and the remainder used in the general heating system. Had this been done, the "Plenum" fans and laundry machinery could have been driven by electric motors, and a considerable annual saving to the institution effected.

Speaking generally of the "Plenum" system of heating and ventilation I feel, in concluding, that it is only just and due to the architects and engineer to state that, in spite of any criticisms which I have offered in these remarks, the scheme as carried out in the Belfast Hospital is, in my judgment, one of the very best that have up to the present time been executed, and, whether other architects follow the daring lead of Messrs. Henman & Cooper or not, the enormous educational advantage that they have given us in having the boldness to carry out their convictions is, I feel sure, properly appreciated by every member of the Institute.

Mr. A. SAXON SNELL [*F.*] said that the original discussion was on Mr. Henman's Belfast

Hospital, which, if he might so put it, was the very incarnation of plenum ventilation; it was built absolutely for that system of ventilation, and its merits and defects would stand or fall by that system. He thought they had not had an opportunity of discussing the hospital and doing justice to the very careful way in which that building had been designed. Many people imagined that the building of a hospital was little more than an arrangement of wards upon certain well-defined lines and the rounding of all the corners; but, as Mr. Henman had showed, it was very much more than that. An enormous amount of consideration had to be given to every detail, and he was much struck with the care, he might say the enthusiastic care, which Mr. Henman had given to the building. It was a curious thing that Mr. Henman had reverted there to a type of building which was erected by his (the speaker's) father no less than forty years ago—a building which was standing now as wards for aged paupers in the Marylebone Workhouse. The wards were very much the same, but rather worse than Mr. Henman's, because they had no top light. They accommodated some 600 or 700 people, who, he was assured, lived to quite a phenomenal age. Nevertheless, he would not recommend that form of ward for hospitals. Turning to the main subject, it was a somewhat unfortunate thing that the question of plenum ventilation had been canvassed so much in the Press by one or two firms commercially interested in the matter. No doubt others, like himself, had been confronted by their clients with a little Blue Book purporting to be a report on the House of Commons ventilation. A little reading of that book would show that it was nothing more than a string of quotations put together, including some remarks of his own, to show that plenum ventilation was a mistake. There was really no need to study such a book, because so many excellent papers had been read upon the subject during the last few years—notably, at the Sanitary Institute and the Institute of Civil Engineers and others. He should like to say that he had no bigoted objection to plenum ventilation. He had tried lately, and he was sorry to say unsuccessfully, to induce a hospital board to allow him to install it for the warming and ventilation of two operating theatres. He should very much like to have done it, because he believed that it was the only method by which those rooms could be properly ventilated and warmed. But they were exceptional buildings, and his whole point was that for exceptional buildings, designed to do exceptional work and built under exceptional circumstances, an exceptional system of ventilation was required, and he knew of no better system than the plenum ventilation for them. But as regarded the class of buildings into which it was desirable to put plenum ventilation, Mr. Henman had somewhat hedged in the paper which had been distributed to them. He told them that he thought it was good for hospitals; but on other occasions he had shown that it was only a question of expense which prevented him advocating it for ordinary houses. He (Mr. Snell) thought that hospitals and houses might be classed together as living places, and those were the places in which he objected to it. Mr. Henman asked—and very rightly—that they should treat the subject scientifically. That was a good point; but they should be consistent, and go deep enough into it. Mr. Henman began by defining the object of ventilation. That was a dangerous thing to do. As Mr. H. G. Wells pointed out at the Royal Institution the other night, definitions were often very misleading, and he (Mr. Snell) thought Mr. Henman's definition of ventilation was also misleading—he would not pause to say why. He (Mr. Snell) had only three points to make, and they had been made over and over again only to be ignored by the advocates of plenum ventilation as fanciful or indefinite. In the first place he submitted that downward ventilation was scientifically or mechanically wrong. If they wanted to move an object it was obvious that the best direction was the line of least resistance, and if they wanted to move it along that line with as little mechanical power as possible, they should take advantage of whatever other forces were going in the same direction; and that was what happened in the ordinary or natural method of ventilation. The principal contamination of air was from their own bodies; but that very air, contaminated as it was, was under a condition which created the very means by which the contamination was taken away from their bodies; because such air was hot, or warm at any rate, and, being warm, it was lighter than the colder air that surrounded it; and that colder air, as Mr. Henman had rightly pointed out, propelled it upwards. Therefore, when, as in plenum ventilation, they had to ventilate downwards, it stood to reason, no matter how economically it was done, that an upward force had to be overcome before they could begin to move in the downward direction. Therefore it was scientifically wrong. His second point was that hot air was absolutely unhealthy. It was pointed out forty or fifty years ago that hot air was bad air to breathe, and the reason was perfectly obvious—because for the same volume warm air contained less oxygen than air at a normal temperature. They could easily calculate how much less oxygen (the very vital element of air requisite to life) was breathed during any given time. That needed no further argument. Thirdly, they were asked to admire the extraordinary evenness of temperature which could be maintained by the plenum system. Monotony was held up to them as a virtue! He confessed that astonished him very much, because they all knew how bad monotony was for them. Everyone who had ever driven or cycled knew how

tiring it was to ride along an ordinary flat road for many miles at a stretch. It was the same with breathing. If warm air was breathed continually, of the same temperature, it became monotonous, and one got tired very soon. It was a curious thing, but the very variations and apparent defects of nature were safeguards. He had not time to refer to those long, unlighted passages for delivering the warm air into the various parts of the building beyond saying that he knew some engineers had recognised the evils of the system, inasmuch as they had suggested the introduction of violet globe electric lights with a view of getting the beneficial effect of sunlight into that enclosed area. He should like to say that he thought Mr. Henman had shown a great improvement, at any rate, in having all his ducts above ground. He remembered many years ago the late Mr. Gordon Smith telling them of a journey on the Continent he had taken with his (Mr. Snell's) father and Dr. Mouatt to see a number of these hospitals. In most cases the machinery was out of order, and they could not see it working; but at one hospital in Berlin it was working, and the superintendent there showed them the system with enthusiasm, pointing out among other matters the ducts where the warm air came in. In one ward it was coming in just immediately under the door. Mr. Gordon Smith observed that dust might be swept into those openings, and he asked that the grating might be taken off. This was done, and Mr. Gordon Smith put his hand to feel where the bottom was, and drew it up two inches thick in mud! So that at any rate with his channels above ground Mr. Henman had improved upon that. But not very much though, because the air still had to be carried along these dark passages, and they knew that air which was not freshened by the sun became foul, even if only in a slight and indefinite manner; and it deposited bacteria on the sides of the channels. Like everything else that was harmful in this life, the pernicious germs always increased and multiplied in the dark; and directly they were subjected to sunlight they became harmless. Finally, there was the moral aspect of the subject. The world was simply full of inventors devising ways of improving on the work of the Creator, and many of those inventions were of enormous benefit to mankind. But there were others which were promoted simply for the purpose of getting round nature and over the effects of its abuse. No greater progress had been made in any science than there had been in medicine during the last century. Yet the great medical men were unanimous in telling their patients that they could only mend them by medicines, and in advising them to go back to nature, to get into the fresh air, and live purely and properly. Drugs and the patent medicines were often excellent in their way for getting over difficulties, and one was liable to fly to them. But they knew that the effect of taking drugs too often was bad in the end, and it was much better to trust to the machinery of nature itself without external aid. Architects in the same way had a great moral responsibility—to advise their clients to keep to natural methods rather than artificial. Unfortunately at most times architects had to do what they were told, and make the best of bad circumstances; but there were many occasions when their advice was sought; he thought they should be at one with the physician in trying to persuade their clients to have their houses built in such a way that they could live healthily, instead of merely comfortably. No doubt it was a great thing to be able to legislate for people and to do everything for them: to feed them, and clothe them, and keep them from the ills of this world; in short, to be an autocrat ruling and controlling the multitude. But there was one thing much better than that, viz. to teach their fellow men to rule and control themselves.

Dr. RIDEAL said that the analogies brought forward by the last speaker were interesting, but he could scarcely be said to have dealt with the subject from a scientific point of view. His premises might be perfectly true, that if fresh air could be introduced into a hospital, or into a house, a reversion to nature was the best thing; but, unfortunately, hospitals were generally built in towns, where the problem of admitting fresh air was not by any means so easy as it was in the case of a hospital, like the Belfast Hospital, laid out in an open space of six acres. In dealing with the problem of ventilation of a hospital ward, and of a building in a confined space, they must all admit that the natural method of opening the windows instead of introducing fresh air did exactly the converse, and a soot-laden, sulphurous, germful, and carbonic-acid-charged mixture was frequently obtained instead. They must have artificial methods of ventilation, and if that proposition were admitted, then the forcing in of pure air must be a method which would commend itself more than relying upon the extraction of air by means of a fan. Thus they were confronted with the problem of the economic introduction and forcing in the pure air. Of course an underground duct without any light might allow the organisms to settle down and multiply; but if they settled down and multiplied there, so much the better for the air. If they did not, but went on forward, then it was necessary to insure the air being rendered germ-free before it went into the hospital. It was obvious from the illustration of the Berlin hospital, where the duct contained two inches of mud, that that method was neither scientific nor commendable. It was possible, however, to introduce fresh air without the objections mentioned by Mr. Snell. The germs and the dust could be removed, and they could provide warm air or hot air, properly humidified, which was capable of being breathed without the

disadvantages mentioned. It was perfectly true that a less quantity of oxygen per respiration could be introduced when the air was warm, but, on the other hand, if that air were germ-free and dust-free, if it were humidified to a proper condition and of the most suitable temperature, there were four advantages against the one disadvantage of having to breathe a little extra in order to take in the quantity of oxygen required. It was obvious to physiologists that, if the oxygen supply was to be maintained, the organism must do a little extra work. It was familiar to everyone that if they required a greater amount of oxygen they must breathe a little quicker to make up for the deficiency of the quantity they took in per respiration. The removal of the gaseous products of combustion and human beings—the removal of the *esprit de corps*, as it had been called—was very necessary; yet, on the other hand, it was extraordinary how very little effect was noticeable from the products of combustion of gas in rooms. It had been asserted that the sulphur in coal gas was most deleterious to people living in rooms where it was consumed. He had recently had occasion to go very carefully into that subject. People did not die twice as fast in Manchester as in London, although the gas there contained more than twice as much sulphur. The advantage of gas burning in rooms from the ventilation point of view where there was no plenum ventilation was very great as compared with electric light. At Birmingham Art Gallery, for example, gas was chosen in preference to electric light, simply because it was a considerable aid to the ventilation. The quantity of sulphur produced in the air of towns from the burning of gas in rooms was only one-thousandth part of the quantity of sulphur that was produced by burning coal in grates. The actual quantity of sulphur in the air of a room that was lit with gas was less than the quantity of sulphur in the outside air on a foggy day, and on an ordinary day it was not very much higher. He was speaking of an ordinary room with an ordinary lime-washed ceiling and with plaster walls. But when one came to modern methods of decoration, and took away this basic lining to the room, and covered it up with an oak dado, and above that with a thick varnished Japanese paper, and put this Japanese paper on the ceiling or painted the ceiling, and removed all the carbonate of lime which absorbed the sulphuric acid produced as soon as it was formed, they had a very different state of affairs. All these modern methods of decoration caused the sulphur contained in such rooms to increase, and that involved seriously the question of ventilation. He was therefore certain that in an ordinary room, the ventilation through the walls, and through the basic lining, rendered the effect of the coal gas combustion not very serious from a ventilation point of view. With regard to hospitals, the passage of germs from individuals was a serious matter in certain diseases only. In the case of the influenza and phthisical patients, the spread of germs by coughing, sneezing, and so on, was a serious matter, and made the removal of this germ-contaminated air by fresh air one of paramount importance. They should be kept damp, and that involved the importance of having humid air introduced into such rooms. Hot air, which was dried and not damp, would desiccate these dangerous germs, and they would fall very rapidly; and that point had to be attended to in such methods of ventilation. There was an instrument which he had used occasionally, and had found of very great value in these ventilation problems, which might not be familiar to some members present—viz. Dr. Aitken's Koniscope, which determined the number of dust particles in the air of a room. It was devised some years ago by Dr. Aitken and based upon the fact that air saturated with moisture, on cooling or compression, allowed the dust particles to form nuclei for the water; when the wet air condensed, there fell upon a glass plate a number of dew-drops corresponding to the number of dust particles in the air. By means of that instrument—a very easily carried pocket instrument—they could determine the number of dust particles in the different parts of the room, and could easily trace the ventilation, and get much better results than they could by means of the anemometer, and with far greater ease than counting the number of organisms or by doing carbonic-acid tests.

The Rev. J. B. LOCK, M.A. (Caius College, Cambridge), said he came to the meeting hoping to learn the comparative merits of the plenum and other systems of ventilation. From what they had heard of the advantages of the plenum system as applied to this hospital, and certain criticisms of the system as applied generally, there seemed to be no doubt of its great value. It appeared to him that they were, and had been for many years, accustomed to mechanical ventilation. Some people spoke as if they were living at a time when mechanical ventilation was new; but surely a fire was a mechanical system of ventilation—it was a vacuum system. They had always been accustomed to keep their rooms warm and sweet by the ordinary fire, which drew the air from the ground level and carried it up the chimney, a supply of fresh air coming in when it could. And there were advantages in this system which occurred to him in listening to the first two speakers. The advantage of a fire ventilation was that the fire did not warm the air which they breathed; it warmed the furniture and the bodies of people in the room by radiation; but the air they breathed was to a great extent of the ordinary temperature of the outside air. They were, he supposed, all familiar with the fact that one could tell, on going into a room where there were a great many people, whether there was a fire burning in it or not simply

by the sense of freshness or stuffiness which one found there. The mechanical system of ventilation by the ordinary open fire seemed to him to be as good a one as could be devised without having recourse to a fan. In regard to the two systems of ventilation, plenum and vacuum, he had had to take the responsibility of helping to decide on systems of ventilation at Cambridge: in one building they decided to have the vacuum system, and in another to have the plenum system. The plenum system was put into the Medical School because in that building certainty as to the amount of ventilation was desirable; that is to say, it appeared to them that the plenum system provided a means of securing a certain quantity of fresh air in a certain time, and at the same time giving warmth. The vacuum system was a mere rule of thumb, so far as it seemed to have been worked out at present; but by the plenum system they had the advantage of forcing in air into rooms through a carefully arranged system of air passages, and by means of valves they could decide how much fresh air they would admit into each room. In a place like a medical school, where in some rooms they wanted a greater quantity of fresh air and in others less, the advantage was overwhelmingly in favour of the plenum system rather than any other system at present before them. With regard to the vacuum system, the arrangement they usually found was that the great chimney of the building was used as an extract shaft into which openings were made from such rooms as were within easy reach of it, somewhat in a casual way. There were probably cases in which the system had been worked out scientifically, but he had not found any specimen of it. It was a good system of its kind—very much like the open fire system—the air in the room was warmed by hot pipes, and the air extracted by this shaft. To illustrate, however, one difficulty of that system, he might mention a certain medical school in the Midlands which he went over while they were discussing these matters. They found there that the central shaft had in it a central iron pipe which was to carry the products of combustion up the chimney, and warmth necessary to convert the shaft into an extracting machine was to be derived from that iron pipe; so that they had, say, a chimney six feet square and a pipe in it of eighteen inches to carry the products of combustion. On some days the extracts worked very well, but on others the heat in the shaft was not sufficient to work the extracts from the top rooms; with the result that the air drawn from the lower rooms passed through the "extract" shafts into the others, carrying the smell of the dissecting room through the whole building. Of course that was not a necessary defect of the extract system; it was only a result of not having sufficient mechanical power to work the extract; but it seemed to point to the necessity, whatever system was employed, of having sufficient mechanical force to control the air currents in the flues. It seemed to him that the plenum system was one which, in certain cases, they could not do without. Take, for instance, Pitman's School of Shorthand, in Southampton Row. In that building, which was a comparatively small one, there were a thousand young men and women at work during the whole day—not the same thousand, but different relays—and they were supplied with fresh air in each room by a fan working in the basement. It seemed impossible to imagine any other system of ventilation by which that building could have been made usable with health and comfort by this large number of people except the plenum system; and while one hoped that architects would evolve methods of applying these various systems in various ways, he, as an outsider, but as one who had had to consider the question, should be inclined to suggest that no one system was suitable in every conceivable case; they must consider what were the requirements of each particular case, and apply the system which suited them. He should like to say a word about what was called the natural system. He perhaps must not speak exactly as he should like to speak, because he held rather a strong opinion on the subject. The "natural system," he understood, was one which was supposed to provide ventilation for buildings without using heated flues or fans or other mechanical means. That the air in a building could be frequently changed effectually without the expenditure of considerable energy was impossible. If we could depend upon the wind blowing steadily with considerable velocity throughout the year, the energy could be obtained from it in various ways, as, for example, by means of large open funnels, as was done on board ship. But to suppose that the heat generated by the bodies and breath of people in a crowded room would supply energy enough for its ventilation was absurd: this, he understood, was what was expected to happen on a calm day by the advocates of the so-called "natural system."

Mr. KAYE PARRY, M.A., B.E., M.Inst.C.E. [*F.*] (of Dublin), said there was one point he thought it important to bear in mind in connection with ventilation, viz., the very great weight of the air which had to be moved. Probably few architects realised that point. Although he had had some experience, he had not realised it himself until it was pointed out to him by the Registrar of the Royal Dublin Hospital, that in the lecture theatre of that hospital, where the plenum system was installed, the weight of air moved in that room in one hour was 20 tons. It was rather remarkable that it should be so, and when they came to look at it from that point of view it would be seen that it would be impossible, without resorting to mechanical means, to move anything like such a weight of air in that time; in fact, as the Registrar had pointed out to some people who were objecting

to the plenum system, if they tried to deliver it as they did coals in a cart, they could not get it in quickly enough. Another point he should like to mention, though he was not there to advocate the plenum system, being a man with an open mind on the subject, but very much interested in the question of ventilation. The point was brought under his notice lately, and showed, he thought, that the plenum system offered great advantages. If, instead of having the plenum system, if they could not have open fires, they adopted radiators, and brought their air inlets under the radiators, they had an enormous difficulty in keeping those radiators clean. Whatever might be said about the difficulty of keeping the air-passages clean with the plenum system, the difficulty was ten-fold greater when the dirt became collected in the folds of the radiator. What happened in one institution, a lunatic asylum, that he was concerned with lately—he had not been concerned with the heating of it, but he examined it lately, and was now concerned with it—was this: The patients selected these radiators as their spittoons, and expectorated into them. The sputum of course dried in the radiators, and there was a very serious aspect to it. The sputum was dried in the radiators, the fresh air was introduced through the tubes of the radiators, and the air came into the building laden with these germs, which were first dried and then carefully distributed into the building for the benefit of the inmates. Now, so far as the plenum system was concerned, they did away with the necessity for any of those coils in the room itself; they could have them down in connection with a subway in places where they could be hosed and cleaned and kept clean; and if that could be done, when the air came into the room under the plenum system there was no opportunity for the patients to foul the air as they could do if radiators were used.

Mr. HAROLD GRIFFITHS [A.] said he had been somewhat surprised and greatly amused at some remarks which had fallen from Mr. Snell. He said that the air in a building ventilated by the plenum system was so regular as not to be conducive to good health—that is to say, that more variation was necessary. But Mr. Snell omitted to state that with the plenum system, in winter time, they could raise their temperature to almost any degree they liked; it is only a question of heating the batteries; and in the summer time the temperature of the air could be at least fifteen degrees lower inside the building than outside. Surely that was sufficient variation. With regard to the plenum installation, if anyone would visit buildings such as workshops, or schools, or any building in constant occupation, especially those occupied by the alien population in the East End of London, if they would go there on a wet day and inspect a building ventilated on the plenum system, and then go to similar class of building with open fires, there would be no doubt in the mind of anybody, whether he was prejudiced against plenum ventilation or not, that the plenum system was the right thing where a building was densely occupied for any considerable time. There were four matters to be borne in mind to make a plenum installation a success. The first was with regard to the air-purifiers. He could not compliment Mr. Henman on the class of screen he had adopted at the Belfast Hospital. He was fully aware that it was the general screen, formed of jute or cocoanut fibre; but although this screen as fixed was an improvement upon the usual kind, it could not on any account be called satisfactory. If the air in Belfast was anything like what it was in London or in most of our provincial towns, it would not be many months before that screen would show the result of impurities being drawn through it. Although this screen was arranged so as to take down in sections, after it had been in use a few months, he ventured to say that neither with the hose, nor with the birch-broom, nor any other appliance could one remove altogether the soot and other deposits upon that screen; and if anyone would walk past a screen which had been in use for twelve months, or two years, in any installation in the United Kingdom, he would find a distinct odour emanating from the screen, which could not but pollute the air which had to pass through it. A fixed screen was not a thing for to-day. A much better screen was that adopted by another patentee—viz. a revolving screen—because it was more cleansing; but that also, in his opinion, was not a perfect screen. He had hoped to have read a short paper that evening to the Institute upon the subject, but as time was limited he had had to postpone it; but when he read that paper, either there or at some other institution, he hoped to show a far more hygienic and sanitary method of cleansing the air than the jute or cocoa-nut fibre screen. The second point he had to mention was with regard to the dust, which in almost all the fifty installations he had visited he had found in connection with the heating batteries. The ducts and the vertical flues were all lined, so that they could be well washed with the hose; but he had never yet seen in the heating batteries anything to protect them from the rust and enable the dust to be properly washed off them by the hose. He had recently been called in to report upon the complaints which had been made about a particular installation, and when he visited the building he found that many of the gratings of the inlets had been partly closed up. Asking the reason, the occupants said that the air coming in was bad air, and the less they had of it the better. As that was the complaint of several of the occupants, he went down into the basement and made a careful examination. He found that all the heating batteries were literally covered with rust and dust, and, of course, directly the batteries became heated a very obnoxious—he

might almost say a dangerous—smell and odour was emitted. All batteries should be either galvanised or covered, so that once a week they could be effectually washed with the hose in connection with the ducts and vertical flues. His third point was in connection with the velocity of the air delivered. Some patentees, and, in fact, some architects, agreed in delivering the air at a very low velocity, and others at a considerably higher velocity. If, however, they had a very low velocity, where the propeller was working, as was done in connection with one patentee whose name was mentioned in connection with Mr. Henman's paper, the velocity was so sluggish that there was not what he might term a sufficient "back" to the air to properly circulate it throughout the whole of the room before it found its way into the extract. Then if they went to the other extreme of another patentee, who had done excellent work in the system, he drove his propeller between 500 and 600 revolutions a minute, and then delivered the air in some of his installations at between 6 and 7 feet a second, with the result that there was a considerable and very objectionable draught caused. He did not know that one could lay down precisely the exact velocity at which air should be delivered; but he thought that for a winter day it should never fall below 4 feet or exceed 5 feet per second, and for a summer day it should never fall below 5 feet or exceed 6 feet per second. That would give a change of air seven times per hour in summer and ten times in winter without causing any inconvenience to the occupants of the building. The last point he should like to direct attention to was in regard to the shape and form of the inlets. There was a tendency, so as to avoid cutting the brickwork in some instances perhaps, or to maintain a more architectural effect in others, to form the bends in the inlets in what he might term too much of a quadrant; consequently the air had a tendency to fall in a horizontal direction upon the heads of the people in the room, instead of properly circulating round the room before it reached the occupants. If the shafts were taken up at a more gentle or a more vertical curve, to shoot that air well up to the ceiling, he felt sure it would obviate the necessity of draughts. With regard to the extract, no lines could be laid down. Every case must depend upon its own merits, but he must say that the extracts in most schemes he had inspected had been much too small. With a plenum ventilation, inducements were wanted to tempt the air to reach the extracts, and it would not be reached without some extract power if those extracts were throttled, as had been the case in, he might say, most of the schemes he had visited. If such matters as these were attended to, which he considered were what he might term the major essentials to a successful scheme, for public institutions and for all buildings where there was continuous occupancy or a large crowd of people assembled, he felt sure there was no better system of ventilation than that known as "plenum."

Mr. E. W. HUDSON [*A.*] said the subject seemed to be one which might be discussed with advantage at some future meetings. He would like to ask whether the advocates of plenum would tell them whether it was an essential feature of the scheme to introduce the pure air at a high level and to extricate the foul air at a low level. If that were the case, it seemed to him that that was scarcely the right thing to do. He remembered many years ago seeing an account by Sir Joshua Jebb of the system he introduced nearly forty years ago at Pentonville Prison. He believed that system had been condemned, and whether it was in use or not at the present moment he could not tell. It seemed to him that the system was an entirely erroneous one; but Sir Joshua's object in introducing it was that the occupant of the cell should not feel the inconvenience of draughts; and his idea seemed to have been taken from the principle of ventilating collieries, which, of course, must be ventilated from above. It seemed to him a wrong system to introduce the pure air at a high level and to extricate the foul air at a low level, and if that was one of the essentials of the plenum system, he should like some explanation of the reason why it was so considered. He should be very happy, if it was the wish of the meeting, to move that the meeting be adjourned. The system, he thought, was of American origin—at all events it had been largely adopted in the United States—and he had endeavoured to obtain some information as to the opinion of American architects with regard to it. This information, however, had not yet come to hand, and should the meeting not be adjourned, if there was anything in it that the editor of the Journal thought would be useful, any information he could get he should be happy to place at his disposal. He understood it had been adopted at the Capitol at Washington, and that it was not a success; and he was desirous of ascertaining, with regard to the large buildings which were contemplated in Boston and New York, whether the architects there contemplated using it. In the City of London were to be seen announcements that such and such a building was to be ventilated on the plenum system, and that showed faith on the part of some of our leading men; and if they could get the opinions of architects of high standing it would be a most desirable thing.—The speaker concluding by asking whether he might move the adjournment of the discussion, the President said he was afraid another meeting could not be arranged for the present session.

Mr. R. LANGTON COLE [*F.*] said they had heard a good deal about the monotony of the air and the possible effect upon the patients, but surely the mechanical system had been in use long enough now for facts to be obtained; and so far as regards its effect upon health, those facts

had not been mentioned to them. Surely it was possible to compare well-designed and large pavilion hospitals on the same scale as the Belfast and Birmingham hospitals, and to know what had actually happened to the patients; what were the percentages of recoveries and the general health of the hospital, as stated by the superintendent in each case. Could not some unprejudiced person tell them what was the actual result? His own opinion and that of many others present was that the mechanical system of ventilation was very useful for special cases, but that for a general hospital it was not necessary.

Mr. ALAN E. MUNBY said he should have been glad to support Mr. Hudson if he had moved the adjournment, because they had had some criticisms and some remarks; but, for the most part, they had not been of a scientific nature, and he thought perhaps that some comments which a mathematical friend of his had been good enough to get together might be of interest. The problem was as to the use of a furnace for ventilation purposes, and he divided the work which was done in the chimney into three headings: first of all, the overcoming of the inertia of the air, which had been already mentioned as a very important factor; secondly, the forcing of the air through the coals of the furnace; and thirdly, the overcoming of the friction of air in the shaft itself. His calculations went to show that as much as 90 or even 95 per cent. of the total work that was done was applied in merely forcing the air through the coals, and therefore, if air was being actually dragged through a furnace which contained a coal fire, that meant a very large proportion of work done as compared with what would be required for a less resistance, say a gas fire. Turning to flues, his friend had worked out the case of a cylindrical flue, and there he divided the total work into (1) that required to overcome the initial inertia of the air, (2) restarting it at the bends, and (3) the friction against the walls. As one of the previous speakers had pointed out, the friction at the bends might be very considerable. If the bend was turned right back upon itself at two right angles, the whole work of restarting the air had to be gone through again; that is to say, the work done at restarting was equal to the whole of the work of moving the air at the beginning; and at a right angle it would be between a quarter and half of that amount. That emphasised the great necessity of rounding off the bends which they all knew to be true, or at any rate placing them in such a direction that the air was stopped as little as possible. He would like to mention one other thing which had always struck him as very much neglected in these cases, and that was the possibility of using the furnace which was to heat the building as a means of ventilation. They had been in the habit of installing furnaces for heating purposes, under whatever system might be used, so that the air was drawn in through the boiler-house door. There was no reason why those furnaces should not be made to suck air through flues, if they were sufficiently closed, in order to ventilate part of a building. The American "Ideal" boiler was, perhaps, one of the most perfectly closed boilers now existing; and he thought it would be interesting to work out the sucking power of a stove to see how it would compare with its warming capacity. He would not trouble them with the actual figures on which the calculation was based, but the result, although it was disappointing, might be of interest: it was that a furnace for a properly heated building was capable of changing the air in the whole building once in every two hours, so that if the furnace was made to suck in the whole of the air from the inside, it would change the air of the building once in every two hours. That would be useless for the purposes of general ventilation; but might it not be applied with economy, where a large building was being heated, to a part of it, which might be so ventilated without any cost at all, except the initial cost of the ducts?

Mr. MAX CLARKE [*F.*] said he took it that their object that evening was to decide more or less whether natural or automatic ventilation should be used, as opposed to what was now known as the plenum system. They had had certain remarks as to the moral aspect of the question, and also remarks which applied more or less to natural ventilation; but they had had no information whatever as to what the advocates of natural ventilation did really advocate. Mr. Snell had said more or less about it, and another speaker mentioned that if the wind always blew in the proper direction things would be satisfactory. He came to the meeting with one or two ideas on the subject, and the only practical information he had received was that the plenum system was good in certain cases. But those certain cases he would like to think were *all* cases where large buildings were concerned—that there was no other method, no automatic method whatever, which would ventilate a large building properly. The object, he took it, was to change the air at a certain specified rate. Whether, as one speaker said, it ought to be 4 feet or 5 feet, or, as another said, 6 feet or 7 feet, he was not concerned with; that was a matter to be regulated by the people who devised the system. Nor was he concerned as to how the air should be cleaned. All those were matters of detail. He was not concerned with whether they used the coir, or whether they used the glass battery tubes covered with glycerine, or any other matter, so long as the air was pure. What he was a little concerned about was, did the mechanical propulsion of that air and the treating of it by washing it and sending it over heating batteries change the air in its essence? That was what he would like some information upon. He had devoted years to

the subject, but this particular point was a purely scientific matter. They knew, or were supposed to know, that four parts in ten thousand of carbonic acid gas was as much as they could do with, and that they should not have more. Supposing they had an automatic plenum system, and into those plenum tubes they discharged a certain amount of oxygen, and reduced the four parts in ten thousand down to two parts, would that air be better than that which was blowing over the ocean; or was there some quality in the air of the ocean which they knew nothing about yet? Was that the thing they wanted? Nobody, he supposed, would for a moment deny that patients would be better always in the sunlight—that, he took it, was granted by everybody—but one could not always have sunlight in Queen Square, where he lived, which was crowded with hospitals; and one could not have sunlight in Liverpool Road, he should think, nor could they always have it at St. Bartholomew's. But given those things, granted that the hospital should be there, was it not better to send in to the patients air as pure as they could make it rather than trust to Providence that they should get it in naturally? That was the question they had to decide. All those little bickerings as to how it should be done, and the bend of the pipes, and the size of them, were absolutely matters of detail which they could not learn all about at first. There was no doubt whatever that any system of mechanical ventilation was capable of improvement; but if nobody began, like Mr. Henman, they should never get to the end. Then there was another point. He thought they, as architects, did not provide a proper system of tubes to carry this air along. In the first place he thought it was the smaller tubes which required very much more attention, and he should like to advocate or suggest that somebody should experiment with cast-iron tubes enamelled in long lengths—not brick tubes, where one had a multiplicity of joints which made the surface very rough indeed, but for all the minor ones cast-iron enamelled ones, and fitted so that they could be opened. He knew it was a problem, but then architecture was a problem from beginning to end, and if a hospital was going to be a place that was properly ventilated, it seemed to him that that was one of the things that required a considerable amount of attention. Mr. Snell said that for exceptional work in exceptional buildings natural ventilation was *not* the thing. But was not every hospital an exceptional building?

The PRESIDENT said the hour was so late he was afraid they must put an end to this interesting discussion. He felt with Mr. Max Clarke that they had not yet quite got to the bottom of it. At the same time there was no doubt that it was a most interesting and vital question for architects to take up. When they erected buildings they must make up their minds as to the best way of ventilating them; and the time had gone by when they could ignore it and put up their buildings without it. He thought, therefore, that they had spent the evening well, and that it might be desirable to devote another evening to the subject. Those were the most useful evenings they spent when they met there and discussed in a friendly way the various problems they had to deal with. There was one point he should like to have heard some opinions upon, viz. as to the question of cost—that is, the comparative cost of the plenum heating and ventilation and the comparative cost of the ordinary steam heating and ventilation. He thought the question of cost was rather in favour of the direct heating system by radiators. But, of course, one had to remember that by the plenum system the building was not only being heated, but was also being ventilated; and therefore, in considering the cost of the two systems, it was not fair to take the cost of heating in one case and the cost of heating and ventilation in the other. Personally he agreed with what many of the speakers had said, that for rooms which were largely crowded with people, class-rooms in schools and institutions of that kind, it was essential to change the air very frequently; and, to his mind, the plenum system was the way by which they could secure a continuous change of air. He thought, for instance, when their own meeting room was full, if they had some means of changing the air a little less natural than opening all the windows at the back, it would be a distinct advantage, especially in the winter. In conclusion the President thanked those who had spoken on the subject, and especially Mr. Pick for the paper with which he had opened the discussion.

MR. GEORGE H. BIBBY sends the following communication, dated 6th June:—

During the past month I inspected the Royal Victoria Hospital at Belfast for the purpose of ascertaining the actual results of the very unusual methods of planning adopted and the effects of the plenum system of ventilation there installed.

I found that fifteen wards (of the seventeen main wards, for fourteen patients each), being lighted only from the roof and from windows at the far ends of each ward, were less cheerful and bright in appearance than the end wards, although the latter had windows only on one side, and not on both sides, as in the case of the best modern hospitals; and the end wards, *with* these windows, have a far less "boxed-in" appearance; in effect, the lengthy and unbroken extent of wall surfaces, where there are no windows, gives a monotonous appearance to the wards, which cannot fail to affect the comfort and well-being of the patients.

I observed that in each of these wards there is a great space above the wall inlets and under the roofs quite unprovided with any means of ventila-

tion; the air inlets being near to the top of the walls, the air introduced passes very rapidly downwards to the outlets near to the floor, thus not ventilating the spaces above the inlets.

It at once occurred to me also that the air in the wards *between* each series of inlets was not being removed from the ward so quickly as the air more directly in a straight line between an inlet and an outlet, and that although the temperature of the ward is kept at a fairly even level, yet the quality of the air must vary very much.

That much of the foul air of some of the wards failed to become ejected by way of the outlets near to the floors (although I ascertained that there was a very strong draught *towards* the outlets) was very clearly indicated by the strong odour of chemicals observed in the small passages between the main corridor and the wards; these odours came from the operating rooms, which were in use at the time of my visit, and were detected so far as the entrances to the main wards and to the interiors of those wards near to the doors.

This mischance may have been the result of some error of judgment or neglect on the part of some members of the staff, but a ventilating system which is dependent entirely for its success upon the *constant* attention of officials is obviously at a disadvantage with the competition of natural systems where arranged in a scientific manner.

It should be observed that the mechanical arrangements in this hospital are very complicated, and the temporary failure of one or more of these, or the occasional results of ignorance or neglect, might at once throw the ventilating and heating arrangements into confusion, while the vast extent of more or less inaccessible fresh and foul air-ducts, difficult to examine, and costly to cleanse, are disadvantages likely to become more troublesome as time advances.

That air introduced through such long and dark passages (as are adopted in this hospital) is less desirable than fresh air introduced by natural systems of ventilation should be admitted; but a disadvantage at least as great, in the case of this hospital, is the arrangement by which the foul air is expelled (or partly expelled) from the wards.

I have pointed out that the foul air and odours from the smaller wards are not wholly expelled by means of the exits provided in the lower levels of those apartments, but find their way to the passages and other wards. But even where carried through to the channels and ducts intended for the purpose, the foul and contaminating air and gases must in time greatly pollute the ducts, infecting the materials of which they are constructed. So long as these ducts really act as outlets, the danger is not so considerable, although the formation of insanitary conditions involves some risk in the event of the air-ducts not being actually air-tight.

But in the very possible event of the provision of fresh air failing through a temporary breakdown of the engines, fans, and other appliances, or of the neglect or ignorance of the officials, the high level inlets might very easily be temporarily converted into outlets, while the "fresh" air would come in (temporarily also) through the openings *intended* to be used as outlets, after passing through the ducts infected by the passage of foul air for considerable periods.

That this reversal of direction is a real danger is certain, as boilers, engines, and machinery, even when in duplicate, as in this hospital, may fail if even for only half an hour; while in the meantime the foul air-ducts, at low levels in all cases (being charged with heated foul air, having no propulsion against which to resist), must return air to the wards by the channels through which it came.

The plenum system, as applied to this hospital, requires that no windows shall be opened, and one of the objections raised by a local authority, who evidently knows the people of the Belfast district, is that the patients will leave the institution with the idea that windows should not be opened where people are sick. This is just the idea most necessary to combat, seeing that many classes of patients recover best when exposed to every wind that blows; and I do not perceive any reason why patients should be compelled to live for weeks and months in an unnatural atmosphere in the wards of this hospital. That it *is* unnatural is admitted by one of the doctors belonging to the institution, who has said that "it always gave him a headache." I am able to confirm this to the extent that, after being in the wards for some considerable time, I experienced a distinct feeling of relief upon again reaching the outer air.

It has been necessary for me during the past few months to seek for detailed information *re* the ventilation and heating of hospital wards. As I am about to issue a work on the subject, very much evidence has been brought before me showing the costly nature of certain plenum systems which have utterly failed, and nothing has yet been advanced to show that a scientific natural system, properly applied, ever failed to obtain better results than were at any time secured by the most costly and complicated mechanical or artificial methods.

From information derived from a leading authority of this hospital I learn that the coal bill in connection with the old buildings for the same number of patients was for only 500 tons, while the present consumption is no less than 2,000 tons!

I must conclude by expressing the pleasure I derived from the inspection of a very fine institution, and which I have only ventured to criticise as regards its general plan being cramped upon insufficient ground area, and the principles upon which the heating and ventilation have been contrived.

*** Messrs. Henman and Lea's reply to the foregoing discussion will appear in the next issue.

9, Conduit Street, London, W., 11*th June* 1904.

CHRONICLE.

The Annual Elections.

The following members acted as Scrutineers in connection with the annual elections of the Council and Standing Committees for the ensuing year of office :—*Fellows*: Messrs. Francis W. Bedford, R. F. Chisholm, George F. Collinson, R. Clarke Edwards, H. Favarger, Alfred H. Hart, H. Carter Pegg, Arthur H. Reid, Hugh Stannus, and J. H. T. Woodd; *Associates*: F. Dare Clapham, Harold Goslett, Baxter Greig, and R. Douglas Wells. The Scrutineers met at the Institute at 10.30 a.m. on Friday, the 3rd inst., and the work of going through the 865 voting papers received, and counting the votes, lasted till 8.30 p.m. Mr. Hugh Stannus [*F.*] acted as Chairman. Their reports having been communicated to the Meeting last Monday, on the motion of the President a very hearty vote of thanks was passed to the Scrutineers for their long and tedious labours. The returns are as follows :—

THE COUNCIL.

President.—John Belcher, A.R.A. [*unopposed*].

Vice-Presidents (4).—*Elected*: Henry Thomas Hare, 692 votes; Alfred Darbyshire, 641; Thomas Edward Collcutt, 522; Samuel Perkins Pick, 478.

Not elected: Leonard Stokes, 395 votes.

Honorary Secretary.—Alexander Graham [*unopposed*].

Members of Council (18).—*Elected*: Arthur Conran Blomfield, 595 votes; John William Simpson, 580; James Sivewright Gibson, 576; William Howard Seth-Smith, 565; Alfred William Stephens Cross, 535; William Flockhart, 528; Samuel Bridgman Russell, 495; Ernest George, 483; William Gillbee Scott, 466; Butler Wilson, 459; Frederic Richard Farrow, 449; William Henry Atkin Berry, 445; George Hubbard, 442; Lewis Solomon, 442; John Slater, 431; Joseph Douglass Mathews, 423; Charles Edward Mallows, 408; Edmund Woodthorpe, 402.

Not elected: Professor Beresford Pite, 391 votes; Edward William Mountford, 380; Paul Waterhouse, 380; George Frederick Bodley, R.A., 378; John Alfred Gotch, 367; John James Burnet, A.R.S.A., 353; Arnold Mitchell, 344; Edwin Thomas Hall, 343; Edward Augustus Gruning, 339; George Halford Fellowes Prynne, 338; Charles Heathcote, 250; Charles Edward Bateman, 249; Ralph Selden Wornum, 239; William Alfred Pite, 233; Colonel Eustace Balfour, 219; William Edward Riley, 215.

Associate Members of Council (4).—*Elected*: William Henry Bidlake, 676 votes; Henry Vaughan Lanchester, 444; Robert Shekleton Balfour, 426; Edmund Wimperis, 387.

Not elected: Percy Scott Worthington, 384 votes; Thomas Edward Pryce, 240.

Representatives of Allied Societies (9).—*Elected*: George Cappinger Ashlin, R.H.A. (Royal Institute of the Architects of Ireland), 601 votes; Henry Langton Goddard (Leicester and Leicestershire Society of Architects), 600; James William Beaumont (Manchester Society of Architects), 582; Thomas Cooper (Birmingham Architectural Association), 576; Arthur William Brewill (Nottingham Architectural Society), 537; George Bertram Bulmer (Leeds and Yorkshire Architectural Society), 537; John Keppie (Glasgow Institute of Architects), 506; Herbert Davis (York Architectural Society), 494; George Herbert Oatley (Bristol Society of Architects), 473.

Not elected: Arthur Southcombe Parker (Devon and Exeter Architectural Society), 450 votes; John Walton Taylor (Northern Architectural Association), 415; Arthur Clyne (Aberdeen Society of Architects), 332; Edward Jenkin Williams (Cardiff, S. Wales, and Monmouthshire Architects' Society), 311.

Representative of the Architectural Association (London).—Edward Guy Dawber [*unopposed*].

AUDITORS.

Sydney Perks [*F.*]; Henry Arthur Crouch [*A.*].

ART STANDING COMMITTEE.

Fellows (10).—*Elected*: Ernest George, 530 votes; Henry Thomas Hare, 528; Thomas Edward Collcutt, 516; Edward Guy Dawber, 476; James Sivewright Gibson, 462; William Douglas Caröe, 441; Edward William Mountford, 409; Sir William Emerson, 407; John Macvicar Anderson, 399; Arthur Edmund Street, 387.

Not elected: John William Simpson, 384 votes; William Flockhart, 383; Paul Waterhouse, 372; William Howard Seth-Smith, 322; George Campbell Sherrin, 212; Herbert Read, 130; Samuel Sebastian Reay, 118.

Associates (6).—*Elected*: Sidney Kyffin Greenslade, 585 votes; Edmund Wimperis, 557; Robert Shekleton Balfour, 536; Henry Tanner, jun., 528; Robert Watson, 518; William Henry Romaine Walker, 510.

Not elected: Stanley Hinge Hamp, 323 votes.

LITERATURE STANDING COMMITTEE.

Fellows (10).—*Elected*: Professor Frederick Moore Simpson, 614 votes; Richard Phené Spiers, 606; Hugh Stannus, 533; Alfred William Stephens Cross, 532; Paul Waterhouse, 515; Henry Heathcote Statham, 492; Charles Harrison Townsend, 481; Charles Edward Mallows, 466; William Alfred Pite, 463; John Bilson, 450.

Not elected: George Halford Fellowes Prynne, 434 votes; Benjamin Ingelow, 396; Francis Hooper, 393; Robert Falconer Macdonald, 352.

Associates (6).—*Elected*: Percy Leslie Waterhouse, 498 votes; Arthur Smyth Flower, 466; Arthur Maryon Watson, 458; Professor Ravenscroft Elsey Smith, 418; Professor Charles Herbert Reilly, 417; Percy Scott Worthington, 414.

Not elected: William Henry Ward, 366 votes; Hubert Christian Corlette, 296; William Adam Forsyth, 282; Walter Ernest Dobson, 182; Frank Lishman, 117.

PRACTICE STANDING COMMITTEE.

Fellows (10).—*Elected*: Joseph Douglass Mathews, 563 votes; Edmund Woodthorpe, 552; William Henry Atkin Berry, 549; William Henry White, 529; George Hubbard, 518; Thomas Henry Watson, 492; Walter Hilton Nash, 476; Thomas Batterbury, 442; Alfred Saxon Snell, 428; Alexander Henry Kersey, 418.

Not elected: Sydney Perks, 408 votes; Ernest Flint, 406; Frederick Ernest Eales, 329; Charles Fitzroy Doll, 298.

Associates (6).—*Elected*: Max Clarke, 513 votes; Charles Henry Brodie, 510; Augustus William Tanner, 497; Herbert Hardwicke Langston, 421; Thomas Edward Pryce, 413; Edward Greenop, 408.

Not elected: Edwin Richard Hewitt,* 377 votes; Herbert Arnold Satchell, 374; William Charles Waymouth, 349.

SCIENCE STANDING COMMITTEE.

Fellows (10).—*Elected*: Thomas Blashill, 634 votes; Herbert Duncan Searles-Wood, 617; Francis Hooper, 592; George Hornblower, 585; Ernest Flint, 581; Alfred Saxon Snell, 579; William Edward Riley, 568; Lewis Solomon, 567; Arthur John Gale, 563; Frederic Hammond, 538.

Not elected: Benjamin Tabberer, 531 votes.

Associates (6).—*Elected*: George Pearson, 555 votes; Max Clarke, 547; Bernard John Dicksee, 540; Henry William Burrows, 500; Edwin Richard Hewitt, 494; Archibald Duncan Watson, 463.

Not elected: Robert Watson, 420 votes; William Jacques, 331.

The Indian Queen Victoria Memorial.

The second number of the "Journal of the Queen Victoria Indian Memorial Fund," dated March 1904, is to hand from Calcutta. The first number appeared in April 1901 [JOURNAL R.I.B.A. 25th May 1901], and the second gives the progress of events since. The project of the Memorial meanwhile has taken definite and concrete shape. A large sum of money, roughly £330,000, has been collected in subscriptions throughout India. The provisional Committee has been replaced by a body of Trustees, created and invested with powers by an Act passed in the Imperial Legislative Council. The Calcutta Maidan has been chosen for the site, Sir Wm. Emerson has been selected architect, his plans have been approved, and work upon the foundations is now far advanced. A photogravure reproduction of the accepted design for the Hall is given as a frontispiece to the Memorial Fund Journal. In addition to its main and central purpose of commemorating Queen Victoria, the building is intended to serve as a National Gallery for India, containing memorials of all that has been great or remarkable in her history, whether relating to events or to persons. Sir Wm. Emerson went to Calcutta in February last year, and in the following month Lord Curzon opened an exhibition of the architect's drawings and of the gifts already presented to the Museum.

In a speech on this occasion describing his plans, Sir Wm. Emerson entered into the considerations which had determined the type of architecture to be adopted for the building. It was finally decided that a style, Occidental in character, which however might admit freedom of treatment, and have blended with it a suggestion of Oriental feeling in some details, would best express the sentiment of a Western monarch reigning over such a country as India. It was therefore decided to adopt Italian Renaissance as best fulfilling these conditions, and in his design, Sir William states, he has endeavoured to give a suggestion of orientalism by the arrangement of the domes and in the details of some smaller features as cantilevers under the cornices, &c., which, while being Italian, might well have some feeling of the beautiful forms found in many parts of India.

As to the plan, to quote Sir William: "A central hall was desired to enshrine a white marble statue representing the Queen in her youth. This I felt should be surmounted by a dome as the principal external and internal feature of the group. Then there were required galleries for the exhibition of sculpture, paintings, arms, trophies, prints, manuscripts, coins, and other things indicative of the connection of the British Empire with India. Also quadrangles were suggested with loggie or verandahs in which, if funds are forthcoming, might be mosaics representing certain historical subjects. Further, a Durbar Hall was asked for, and a Princes' Hall for Rajas' exhibits. . . . The plan is in the form of a capital H, the ends being joined by curved arcading. The cross of the H forms the central hall, and the galleries and durbar the sides.

"There would be staircases at the corners of the dome giving access to the galleries in the Durbar Hall, Princes' Hall, Central Hall, and Vestibule, and to the Curator's Office over the north entrance, also to the top of the dome. At each corner of the building would be a tower some 30 feet square.

"The whole structure will stand on a terrace, some six or seven feet high, extending some forty feet in width all round the building. The north porch will be approached by a grand flight of steps surmounted by the bronze statue of the Queen by Mr. Frampton.

"The whole terrace and building will be faced with white marble from Makrana and Greece, those portions which admit of being easily worked by hand being prepared here of the beautiful Indian marbles, while the other portions that require the use of expensive machinery, which it would be too costly to erect in India, will be procured from Greece. . . . Internally the Queen's Hall will be lined with white marble and coloured panels of Indian marbles and some frescoes or mosaics in the lunettes over the gallery. The other rooms and Durbar Hall will be lined with dadoes and piers of light-coloured Indian stone; and the portions of the walls not stone and the ceilings will be faced with the fine native shell plaster."

Lord Curzon thus pictures the building and surroundings when the architect's conception is realised: "A beautiful and spacious park, in the middle of which will rise the glittering marble structure, standing upon a terrace of white marble and facing northwards across the Parade Ground, with its central dome of white marble soaring into the air to a height of 160 feet, and visible from every part of the river and the Maidan."

* By an oversight Mr. E. R. Hewitt's name was omitted from the list of attendances published in the Supplement to the JOURNAL of the 8th May. Mr. Hewitt should have been credited with eight attendances, having been present at all the meetings held by the Science Committee during the period covered.

As to the construction the soil is better than Sir William anticipated. "There are no soft spots, though there is the difficulty of the blue clay at a certain depth which has to be contended with. The concrete is spread so that there will be $1\frac{3}{4}$ tons on every superficial foot of soil under the concrete at every point. The walls will be of solidly built brickwork faced with marble externally, and marble and stone and plaster internally.

Mr. T. H. Holland, Director of the Geological Survey of India, contributes to the Journal some notes on the Ornamental Building Stones of India, with a map showing their distribution throughout the country; and there is a Report on the Marble Quarries of Rajputana by Mr. R. L. Sevenoaks, Superintending Architect.

The Secretary R.I.B.A. and the Spanish Architects.

The Secretary of the Institute, who was one of the official delegates of the R.I.B.A. at the recent International Congress of Architects held at Madrid, has received the honour of election as Hon. Corresponding Member of the Sociedad Central de Arquitectes, Madrid.

The International Congress of Hygiene at Brussels.

In the Annual Report of the Council, p. 357, omission was inadvertently made of the name of Mr. Thomas W. Cutler [*F.*] as representative of the Institute, with Mr. John Slater [*F.*], at the last International Congress of Hygiene and Demography held at Brussels. Mr. Cutler is one of the permanent officers of these Congresses. The report of the Institute representatives was published in the JOURNAL for last October.

Obituary.

Mr. John Goodacre [*F.*], of Leicester, sends news of the death of his brother, Robert Johnson Goodacre, a past President of the Leicester and Leicestershire Society of Architects, and till recently a Fellow of the Institute, elected in 1882. He retired from practice about four years ago.

William Alfred Royle, of Manchester, whose death is announced, had been a Fellow since 1888. In partnership with the late Mr. Robert I. Bennett he carried out many offices and warehouses in Manchester, and numerous buildings for the Manchester School Board. He was twice elected President of the Manchester Society of Architects.

Mr. ALEX. GRAHAM, F.S.A. (*Hon. Secretary*), having made the above announcements at the General Meeting last Monday, Mr. S. PERKINS PICK (*Vice-President elect*) said that Mr. Robert Johnson Goodacre had been for many years one of their leading architects in Leicester. He was highly respected, not only by every member of the profession, but also by the town in general. He was a magistrate for the borough, and had done dignified and useful work. His decease was very greatly regretted by every member of the profession in Leicester.—Mr. J. W. BEAUMONT [*F.*] said that, as President of the Manchester Society of Architects, he should like to say that they in Manchester regretted very much the death of their friend Mr. Royle. He was an old Manchester architect, and both he and his partner, Mr. Bennett, who was also a Fellow of the Institute, had died within the last twelve months. Mr. Royle was particularly well looked upon in Manchester as a man of good judgment and very fair in his dealings with everybody he came in contact with. His death was extremely regretted by the Manchester Society.

The late Mr. Birch.

Erratum.—Mr. George Patrick [*A.*] writes to the Hon. Secretary:—"In the obituary notices in the current issue of the JOURNAL, it is stated that George Henry Birch was the son of the late Dr. Samuel Birch, of the British Museum. Allow me to say that this is not the case. George Henry Birch was an old and valued friend of mine since 1862, when he entered the office of the late Sir M. Digby Wyatt, of whom I was an articled pupil. We became close friends, and in 1863 spent a holiday together in Worcestershire. In speaking of his family I never heard that his father was connected with the British Museum; and my friend, Dr. Walter de Gray Birch, F.S.A., who *is* the son of the late Dr. Samuel Birch, the Egyptologist, tells me the statement is 'absolutely wrong,' and he would be obliged if you would kindly have it corrected."—[The Editor has to explain that the brief details given in the JOURNAL of Mr. Birch's career were quoted from one of the weekly papers, and he gladly gives publicity to the correction.]

MINUTES. XV.

At a Special General Meeting held Monday, 6th June 1904, at 8 p.m.—Present: Mr. Aston Webb, R.A., F.S.A., *President*, in the chair, 50 Fellows (including 16 members of the Council), 56 Associates (including 3 members of the Council), and several visitors: the President read the Resolution passed at the Business General Meeting of the 5th March—viz. "That the necessary alterations to the By-laws be drafted and submitted to a Special General Meeting to provide that after the 31st December 1906 every person desiring to be admitted a Fellow shall be required to have passed the Examination or Examinations qualifying him as an Associate, or shall be elected from the ranks of the Associates; but that, in exceptional circumstances, the Council shall have power to dispense with such Examination or Examinations." The President, having stated that the addition to By-law 3 which the Council proposed in order to carry the above Resolution into effect had been approved by the Institute solicitors, thereupon moved, and the Meeting unanimously

RESOLVED, that the following words be added at the end of the first clause of By-law 3—viz.

"After the 31st December 1906 every person desiring to be admitted a Fellow shall be required to

have passed the Examination or Examinations qualifying him as an Associate, or shall be elected from the ranks of the Associates. But in special cases the Council by the votes of three-fourths of such Members of the Council as are present and voting at a meeting of the Council shall have power to dispense with such Examination or Examinations."

The Special General Meeting then terminated.

At the Fifteenth General Meeting (Business and Ordinary) of the Session held at the conclusion of the Meeting above minuted, and similarly constituted, the Minutes of the Meeting held Monday, 16th May [p. 309], were taken as read and signed as correct.

The Hon. Secretary announced the decease of Robert Johnson Goodacre, of Leicester, elected Fellow 1882, and recently retired; and William Alfred Royle, of Manchester, *Fellow*, elected 1888. Tribute of respect for the qualities of the deceased gentlemen was paid by Messrs. S. Perkins Pick [*F.*] and J. W. Beaumont [*F.*] on behalf of the Allied Societies at Leicester and Manchester respectively.

The Hon. Secretary drew attention to a list of books [*see Supplement*] recently acquired by the Library either by presentation or purchase, and mentioned that during next Session he hoped to make a short statement with reference to the principal works added during the past Session. A vote of thanks to donors of books was passed by acclamation.

The following members attending for the first time since their election were formally admitted by the President—viz. Thomas Dinwiddy [*F.*], Henry Edmund Davey [*A.*], and Holland William Hobbiss [*A.*].

The Secretary having read the reports of the Scrutineers with reference to the election of the Council and Standing Committees, the candidates reported successful were thereupon taken to be duly elected to the various offices.

A vote of thanks to the Scrutineers for their services was passed by acclamation.

Before proceeding to the election of members the President explained that the names of the candidates had first been submitted to the Council, then published in the Journal with a request for any objections to be submitted to the Council within a specified date; that objections received were duly investigated, and if found valid the candidate concerned would be rejected. A Fellow present proposing to raise an objection to one of the candidates, the President ruled that it was not competent to him to do so at that meeting. The election then proceeded and the following candidates were elected members by show of hands under By-law 9:—

As Fellows (18).

THOMAS ARNOLD [*Assoc.* 1867] (Edinburgh).
WALTER ALBERT CATLOW, Leicester.
MAX CLARKE [*Assoc.* 1880].
ALLAN OVENDEN COLLARD [*Assoc.* 1889].
WILLIAM HENDERSON DUNCAN, Rochdale.
EDWARD GOLDIE.
ALFRED HENRY HART [*Assoc.* 1890].
CHARLES GROVE JOHNSON, Mexico.
WILLIAM CAMPBELL JONES [*Assoc.* 1888].
WILLIAM ALFRED LARGE.
THOMAS EDWARD MARSHALL, Harrogate.
JOHN CAMPBELL TURNER MURRAY.
JOHN HENRY PHILLIPS, Cardiff.
ALFRED ROBERTS.
WILLIAM RUSHWORTH.
PERCY BURNELL TUBBS.
JOHN COLLINGWOOD TULLY [*Assoc.* 1882] (Cape Town, S. Africa).
BENJAMIN WOOLLARD [*A.* 1889].

As Associates (2).

CHARLES ROSENTHAL [*Qualified as Assoc., Colonial Exam. Sydney, N.S.W.* 1903] (Sydney, N.S.W.)
HERBERT ALFRED HALL [*Probationer* 1899, *Student* 1900, *Qualified* 1903].

As Honorary Associates (2).

JAMES JEBUSA SHANNON, A.R.A.
Lord STANLEY OF ALDERLEY.

As Hon. Fellow.

The Right Hon. Lord CURZON OF KEDLESTON, G.M.S.I., G.M.I.E., Viceroy of India.

Some Notes on the Plenum System of Ventilation, by Mr. Wm. Henman [*F.*], having been previously issued to members for the purposes of discussion at the Meeting, a further Paper was contributed and read by Mr. S. Perkins Pick, subsequent speakers being Mr. A. Saxon Snell [*F.*], Dr. Rideal, the Rev. J. B. Lock, Mr. Kaye Parry [*F.*], Mr. Harold Griffiths [*A.*], Mr. Alan E. Munby, Mr. Langton Cole [*F.*], Mr. E. W. Hudson [*A.*], and the President.

The proceedings then closed, and the Meeting terminated at 10.20 p.m.

REVIEWS.

PAINTING AND DECORATING.

Paint and Colour Mixing: a Practical Handbook for Painters, Decorators, and all who have to mix Colours, containing many Samples of Oil and Water Paints of various Colours, including the principal Graining Grounds, and upwards of 500 different Colour Mixtures. With 8 coloured plates. By Arthur Seymour Jennings, Editor of "The Decorator," author of "Wall Papers and Wall Coverings." Second Edition, re-written and enlarged. 8o. *Lond.* 1904. *Price* 5s. *net.* [*E. & F. N. Spon, Ltd., 125, Strand.*]

A second edition of this handbook, which architects and builders will find very useful for reference, has been called for within eighteen months of its first issue. The examples of colours, a prominent feature of the first edition, have been increased from 64 to 171, the mixtures in every case being made with actual paint or water colours, not with printer's ink. The fresh matter added includes some valuable notes on colour harmony, a chapter on colours producible by the admixture of various pigments with black japan, and a chapter on the washable and other water-paints now so much favoured. Humane objectors to lead in materials will note with satisfaction the author's pleas for zinc white or zinc oxide instead of white lead. First, it is non-poisonous; then it is beautifully white—an important factor in paint-mixing, as the purity of the original colour is retained, whereas the yellowish cast of lead to some extent destroys the colour it is mixed with. Zinc white, too, has considerable body, is economical in use, and will last twice as long as lead, especially in large cities, where the air is impregnated with sulphur from burning coal. The average "decorator" of the suburban house takes little count of the laws of colour harmony; he

is either venturesome to audacity in his defiance of them, or else is too timid to hazard anything at all in the way of colour contrasts. It would, of course, be good for him to cultivate a taste for harmonic colouring, and think out schemes for himself. Failing this, however, he can go to Mr. Jennings' book and get, cut-and-dried, a correct colour-scheme without any thinking at all. Mr. Jennings might further suggest to him that the effect of the cornice in a room would be greatly enhanced if it were treated as part of the wall—not as part of the ceiling, as seems to be the rule in modern practice.

ALLIED SOCIETIES.

CARDIFF, SOUTH WALES, AND MONMOUTHSHIRE SOCIETY.

Professor Beresford Pite on Registration and Education.

The Annual Dinner of the Cardiff, South Wales, and Monmouthshire Architects' Society was held at the Royal Hotel, Cardiff, on 19th May, the President, Mr. Jenkin Williams [*F.*], in the chair. The guest of the evening was Professor Beresford Pite [*F.*], and among other visitors were Mr. W. Henry White [*F.*] and Mr. E. Harding Payne [*A.*].

Professor Beresford Pite, in responding to the toast of "The Royal Institute of British Architects," expressed his pleasure at revisiting South Wales, where he had commenced his professional training, nearly thirty years before, in the office represented there by his friend the Treasurer, Mr. E. H. Fawckner, and thanked Mr. Seward for the terms in which he had proposed the toast, and for the opportunity he had given for an allusion to current professional politics. He much feared, he said, that political discussion was taking the place of architectural enthusiasm among them, and that the spirit of emulation in the art of design would suffer if interest was so largely devoted, as of late, to matters which ultimately were those of personal and professional advancement only. It would be admitted by all, he hoped, that the increasing beauty and interest of their buildings would be a valuable aid towards obtaining proper recognition and respect from the public, and from public bodies. Such a view of the situation, too, would relieve them of merely local considerations in such a matter as confining local work to local architects only. This would be desirable and possible where a defined and characteristic school of local architecture existed; but, personally, after their delightful visit that afternoon, he could not but be thankful that Cardiff Castle was not designed by a Cardiff architect, and that William Burges had been given the opportunity of conferring lustre upon their town by creating within it a work of art which for many generations would make it a notable example of the splendid architectural attainment of the best period of the Gothic revival. He wished to assure them that no spirit of local narrowness animated the Institute Council in London, and instanced the recent nomination lists for candidates for the selection of an architect for the additions to the British Museum in London, in which the Council placed seven provincial architects and seven non-members of the Institute among those upon whom they proceeded to vote. As Mr. Seward had given him the opportunity, he would remark how much he thought the recent propaganda in connection with the election of the Council was to be regretted. Apart from the merits of registration, or of a Registration Bill, he considered it an unwise policy on the part of those who were in favour of such a movement, while the large and representative committee appointed at the Special General Meeting was sitting, to issue a declaration which, if signed and acted upon as requested, could only have the effect of splitting the profession into two opposing camps. If there was one question more than another upon which it was necessary to unite rather than to divide the profession, it was certainly upon one in which architects proposed to appeal to Parliament. The method of dividing the profession into rival lists, or camps, would not only render useless and futile the labour of the Representative National Committee appointed by the Institute, but also consolidate that opposition which was so largely felt, and felt by those who most really represented the artistic feeling for architecture as an art, in the face of which opposition no progress whatever could be made. Let this become a matter upon which the profession could be united by reason, by interest, and by common devotion to the art which it practised, rather than one which divided invidiously into rival camps, and produced irreconcilable party warfare. The Institute Committee was sitting with a *bona fide* purpose of considering the whole matter thoroughly, and of reporting to the general body, and until it had completed its work, suspension of forcible expressions of opinion and of committals on both sides was desirable and necessary. He would mention in this connection the important fact that a Bill in the promotion of which the Council of the Institute assisted had now been introduced into Parliament for the legal protection of the titles of chartered societies, the effect of which was that the Institute initials of diploma would be protected from use by improper persons who were not entitled to them, such prohibition not existing at present. This measure would strengthen the position of all members of the Institute, and was an important step towards the proper recognition of the architect's status as a member of his chartered society. Referring to

the alliance of the Provincial Societies with the Institute, Professor Pite emphasised the importance of making the central body of the profession representative in order to give weight and effect to its action. An increased membership alone would ensure this; and as there were over 1,000 members of Allied Societies who were not yet members of the Institute, it was a primary matter that as many as were eligible should at once apply for the Fellowship, and that the rest should qualify for the examination. He cordially believed that the strengthening of the Institute and the inclusion within its ranks of all good architects was the best and at present the only policy which would be of value to the profession. The Institute was a body charged to promote the art of architecture, and necessarily and incidentally the interests of its practitioners by mutual fellowship. Architecture was an art which appealed to, claimed, and found success in winning the attention and appreciation of the world, and no appreciation was more valued by the architect than that of his cultivated brethren; and a sense of their fellowship in its practice, with their comprehension of the difficulties and limitations which attended present-day efforts to attain a high standard of design and construction, was of the greatest value. This fellowship of artistic sympathy, to a certain extent, could only be found within such a body as an Institute of Architects. There were also the more difficult matters connected with the maintenance of a high standard of professional conduct as between architect and architect and towards clients and the public. The delicate questions that arose in these matters could be better considered and dealt with by the small "Professional Questions" Committee of the Council of the Institute than by any other body. The judgment of independent professional brethren sitting in London could in these matters be of especial value to provincial architects, and in many cases such a committee was able to offer advice and help which would not be obtained from a formal or more distinctly judicial tribunal. Professional interests needed in the matter of competitions such active and intelligent watching as could best be obtained by the action of the central body of the profession. He appealed to all members of the Allied Societies at once to put before the promoters of any competitions of which they had private knowledge the Institute paper of Suggestions for the Conduct of Competitions. If promoters objected to interference it should only be necessary to point out that the inauguration of a competition implied a great amount of labour and expense on the part of many architects which the promoters often were in complete ignorance of, and that it was most proper and advantageous that the Suggestions of the central body for the protection of its own members in the expenditure of their time, thought, and labour, unremuneratively in the vast majority of cases, should be complied with, and that unless an agreed standard of regulation in their conduct was accepted architects of ability and high standing would not submit designs, and the ultimate result must be that only second-rate men would enter these competitions. The services of the Institute were also much needed for pressing upon municipalities and public bodies the just claims of architects within their own districts, and generally for consideration in the disposal of commissions for public works. While willing to overlook and forgive much professional want of qualification or other training in anyone who could and did produce a beautiful building, there being no narrowness in any true view of artistic qualification, it was essential to the honesty of public life and in the true interests of the community to insist that they, as architects, had a right to protest against a municipal engineer or surveyor professing, or being employed, to design or carry out public buildings which all the time were being done for him by some talented but inadequately paid and improperly recognised architectural assistant or "ghost" upon his salaried staff. The principal work of the Institute had of recent years been the establishment of the examinations, and it had now become necessary to carry its work beyond the examinations to the education preparatory to and presupposed by them. This perhaps had been better undertaken years ago, but an important Education Committee had been sitting for the purpose of agreeing upon a scheme of architectural education which would be available for all students, and form a guide to more teaching bodies which were so rapidly taking up architecture as part of their course, and be of assistance to those newer Universities that contemplated bestowing degrees in architecture. The importance of bringing these great bodies into line with the central body of the profession was very evident. The constitution and work of this Education Committee upon which sat representatives of the colleges where architecture was at present taught, including the very distinguished Principal of the University of London, augured well for the success of their work, and he ventured to impress upon his hearers that education was now the prime matter of importance in the question of an architect's status, and that any hasty steps now, while a complete educational scheme was immature and almost non-existent, would be dangerous, and hinder for many years proper progress upon those lines in which the Institute could effectively assist. In conclusion, Professor Pite urged them to remember in all the controversy of the hour that architecture was more than a profession; it was an art that called for a high standard of intellectual culture which it was theirs to express in their buildings, and by that alone would they justify individually their claim to the honoured title of architect.